



NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

Technical Report
TR-6014-OCN

MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

by

NFESC Staff

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13. ABSTRACT (Maximum 200 words) The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.							
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EXECUTIVE SUMMARY

The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.

This report consists of a directory that lists the type of information provided, its subdirectory, the name and type of the file. In some cases the same information is provided in various forms (for example, as both a spread sheet and a picture of the spread sheet in image form), because engineers may wish to use the files in various ways.

DIRECTORY

This table lists the types of information provided, its directory, file name and file type.

Table. Listing of Empirical Information

ITEM	FILENAME	DESCRIPTION
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pox	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link
C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring

C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy

E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class

		A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3_10.dxf	Tension Bar Mooring Buoy
E3	e3_10.pcx	Tension Bar Mooring Buoy
E3	e3_11.dxf	Hawsepipe Mooring Buoy
E3	e3_11.pcx	Hawsepipe Mooring Buoy
E3	e3_12.dxf	Tension Bar Mooring Buoy
E3	e3_12.pcx	Tension Bar Mooring Buoy
E3	e3_9.dxf	Standard Marker or Mooring Buoy
E3	e3_9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Howser Reels
J3	j3.pcx	Vertical Howser Reels
J4	j4.dxf	Horizontal Hawser Reels

J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor
L1	L1.WK1	NAVSEASYSCOM allhulls listing of ship information
L2	L2.xls	NAVSEASYSCOM ship chain specification data
L3	L3.xls	NAVSEASYSCOM fiber rope specification data
L4	L4.xls	NAVSEASYSCOM shackle specification data
L5	L5.xls	NAVSEASYSCOM wire rope specification data

APPENDIX A

MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

APPENDIX A
MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

This appendix includes various supporting figures, tables and drawings in digital form that support the handbook. Table A-1 lists the file names and gives a description of each data file.

Table A-1. Listing of Empirical Information

ITEM	FILENAME	DESCRIPTION
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pcx	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link

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C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring
C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless

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Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand		
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy
E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

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E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3_10.dxf	Tension Bar Mooring Buoy
E3	e3_10.pcx	Tension Bar Mooring Buoy
E3	e3_11.dxf	Hawsepipe Mooring Buoy
E3	e3_11.pcx	Hawsepipe Mooring Buoy
E3	e3_12.dxf	Tension Bar Mooring Buoy
E3	e3_12.pcx	Tension Bar Mooring Buoy
E3	e3_9.dxf	Standard Marker or Mooring Buoy
E3	e3_9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38

MIL-HDBK-1026/4

Class Ships		
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Hawser Reels
J3	j3.pcx	Vertical Hawser Reels
J4	j4.dxf	Horizontal Hawser Reels
J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor

TABLE 2
Capacity of Standard Navy Fleet Moorings
(Riser-Type)

Previous Class	Moorings Capacity (pounds)	Number of Ground Legs	Riser Diameter (inches)	Type of Chain Throughout
AA	300,000	3 (Twin chain)	4	U.S. Navy Common A-Link
BB	250,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
CC	200,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
DD	175,000	3 (Single chain)	3	U.S. Navy Common A-Link
A	150,000	3 (Single chain)	2-3/4	U.S. Navy Common A-Link
B	125,000	3 (Single chain)	2-1/2	U.S. Navy Common A-Link
C	100,000	3 (Single chain)	2-1/4	U.S. Navy Common A-Link
D	75,000	3 (Single chain)	2	U.S. Navy Common A-Link
E	50,000	3 (Single chain)	1-3/4	U.S. Navy Common A-Link
F	25,000	3 (Single chain)	1-1/4	U.S. Navy Common A-Link
G	5,000	3 (Single chain)	3/4	U.S. Navy Common A-Link

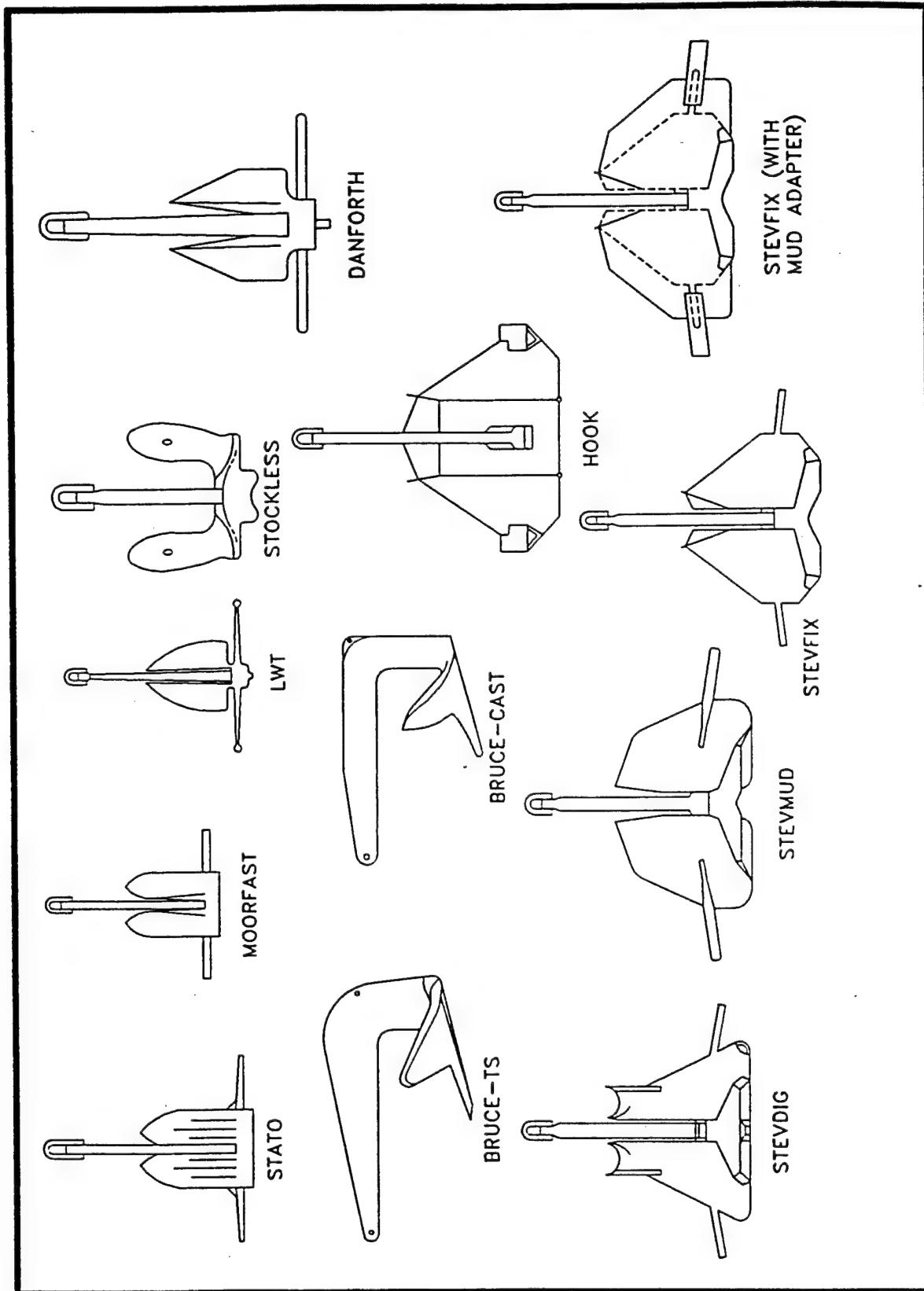
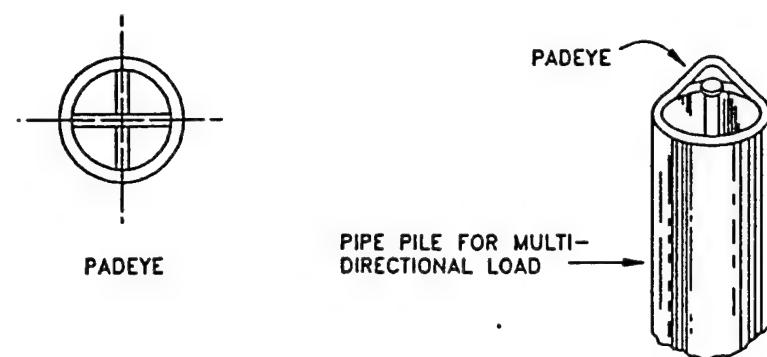
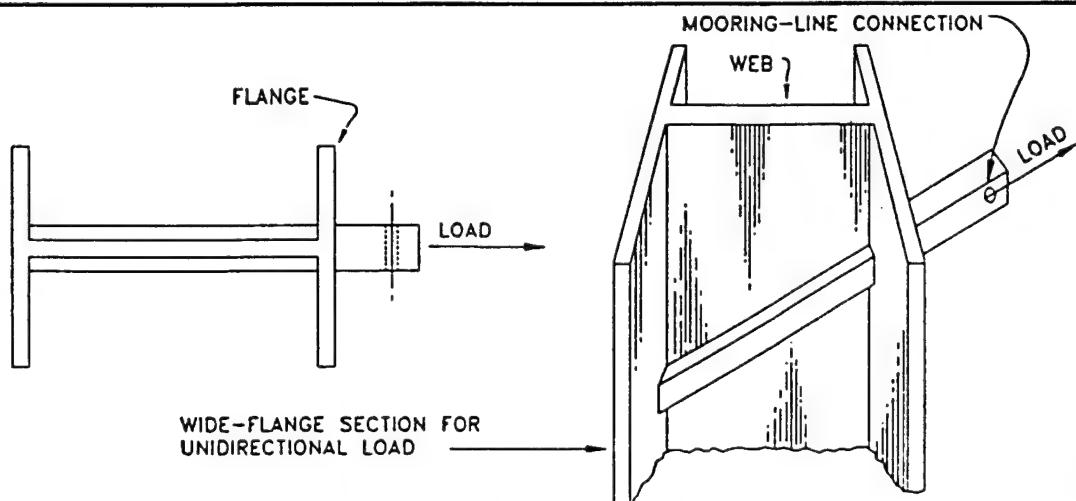


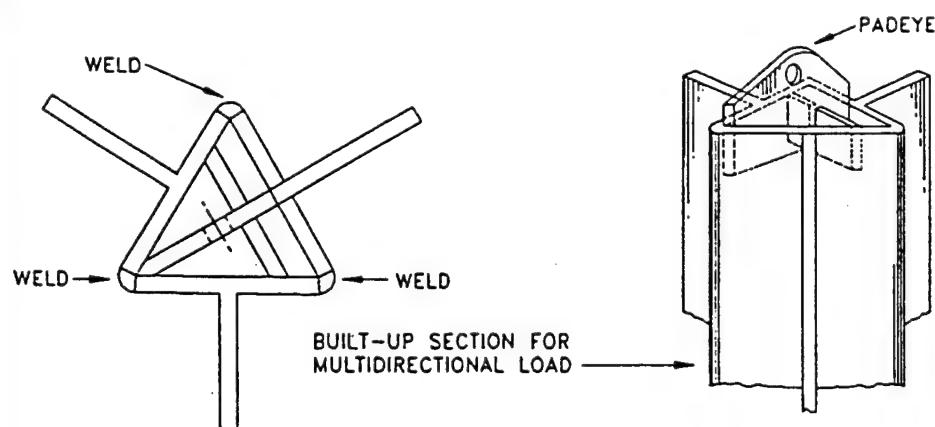
FIGURE 14
Types of Drag-Embedment Anchors



A - PIPE PILE

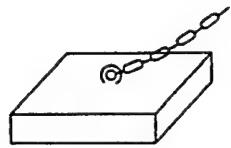


B - WIDE-FLANGE (WF-) SECTION

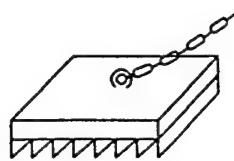


C - BUILT-UP SECTION (COMPOSED OF T-SECTIONS)

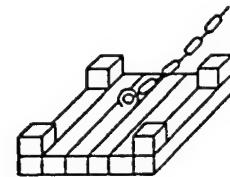
FIGURE 16
Types of Pile Anchors



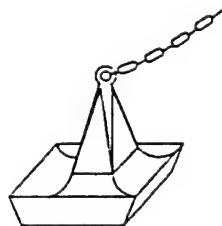
SQUAT CLUMP



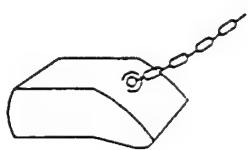
CONCRETE SLAB WITH
SHEAR KEYS



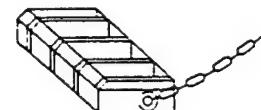
OPEN FRAME WITH
WEIGHTED CORNERS



MUSHROOM



WEDGE
OR
PEARL HARBOR



SLANTED SKIRT

FIGURE 16
Types of Deadweight Anchors

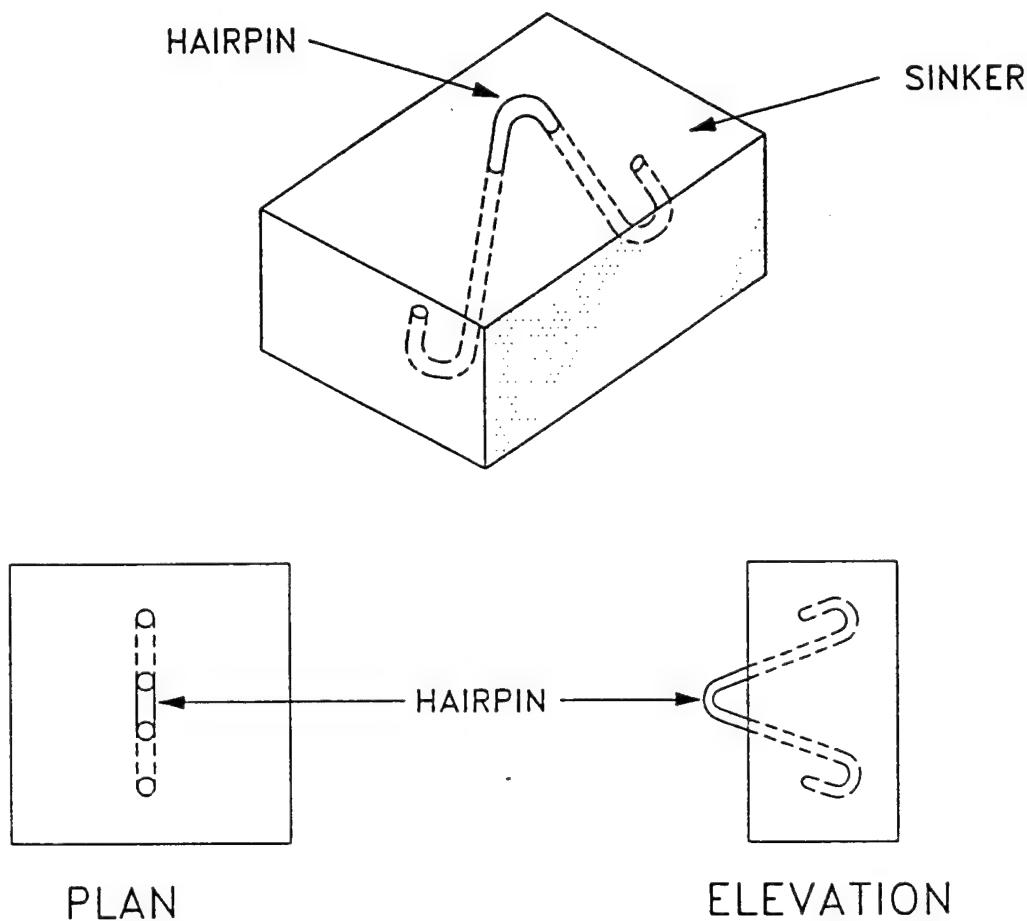


FIGURE 24
Concrete Sinker Used in Standard Navy Moorings

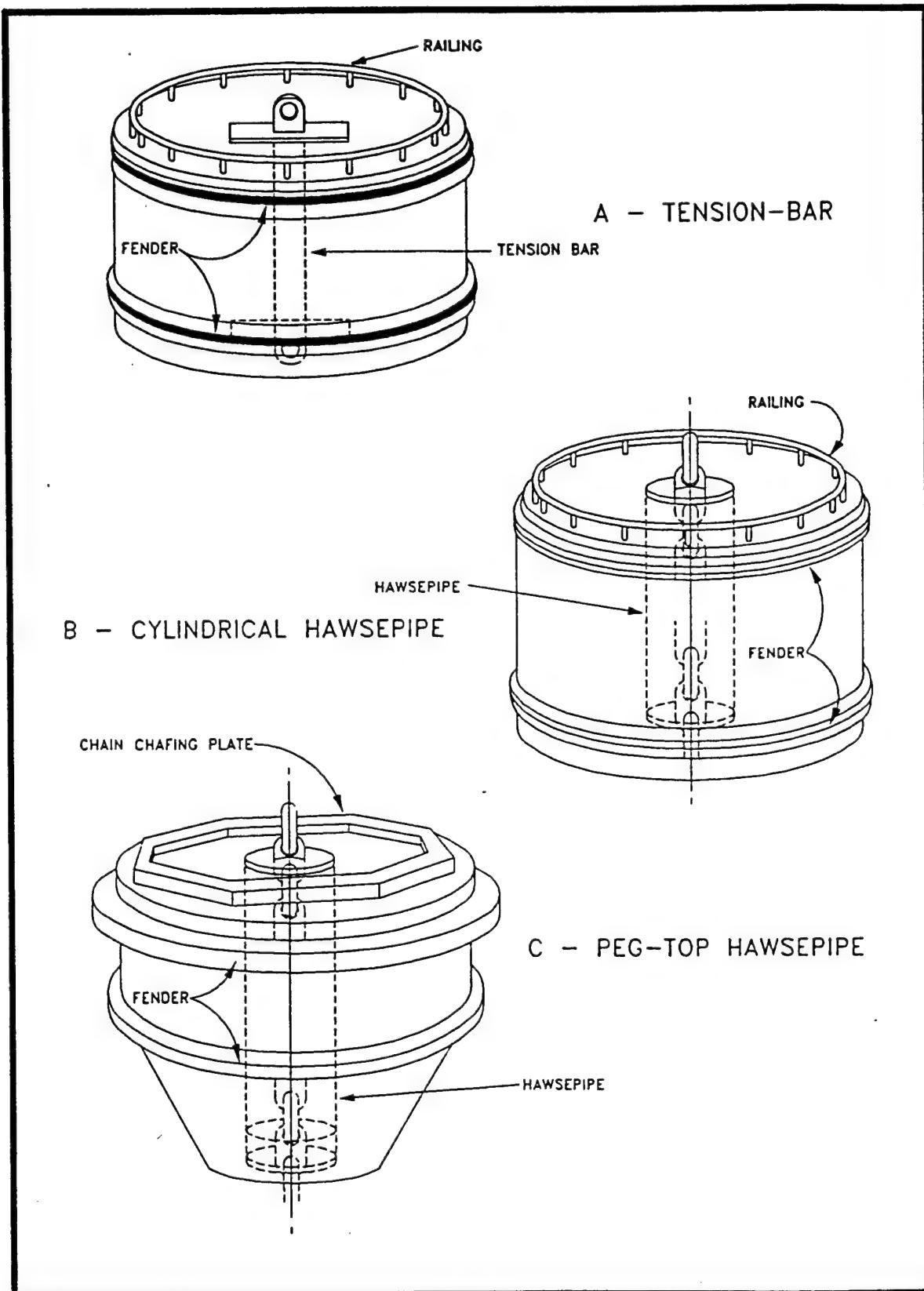


FIGURE 36
Riser-Type Buoys

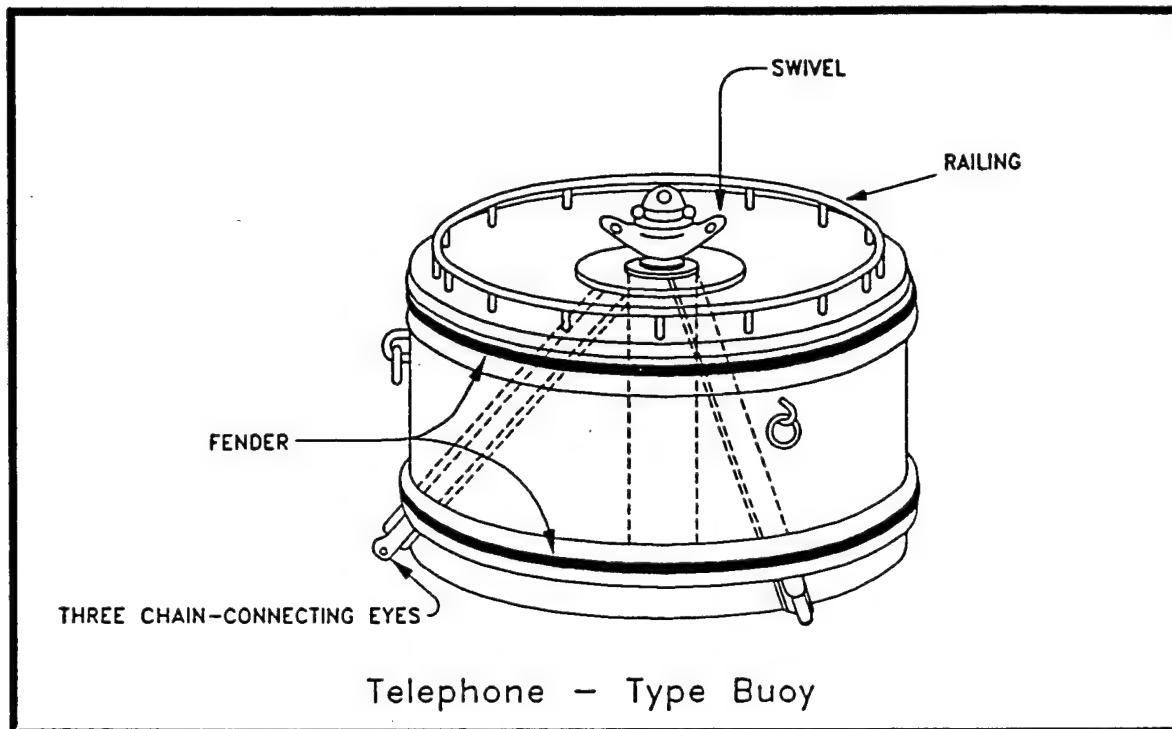


FIGURE 37
Telephone-Type Buoy

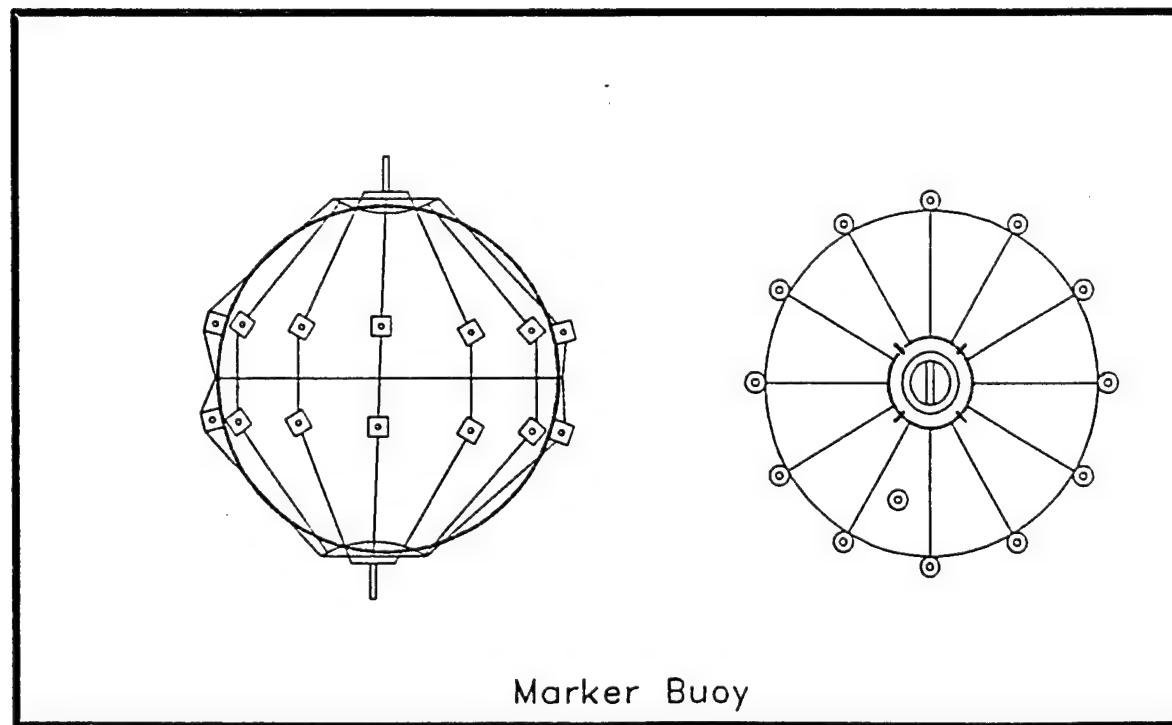
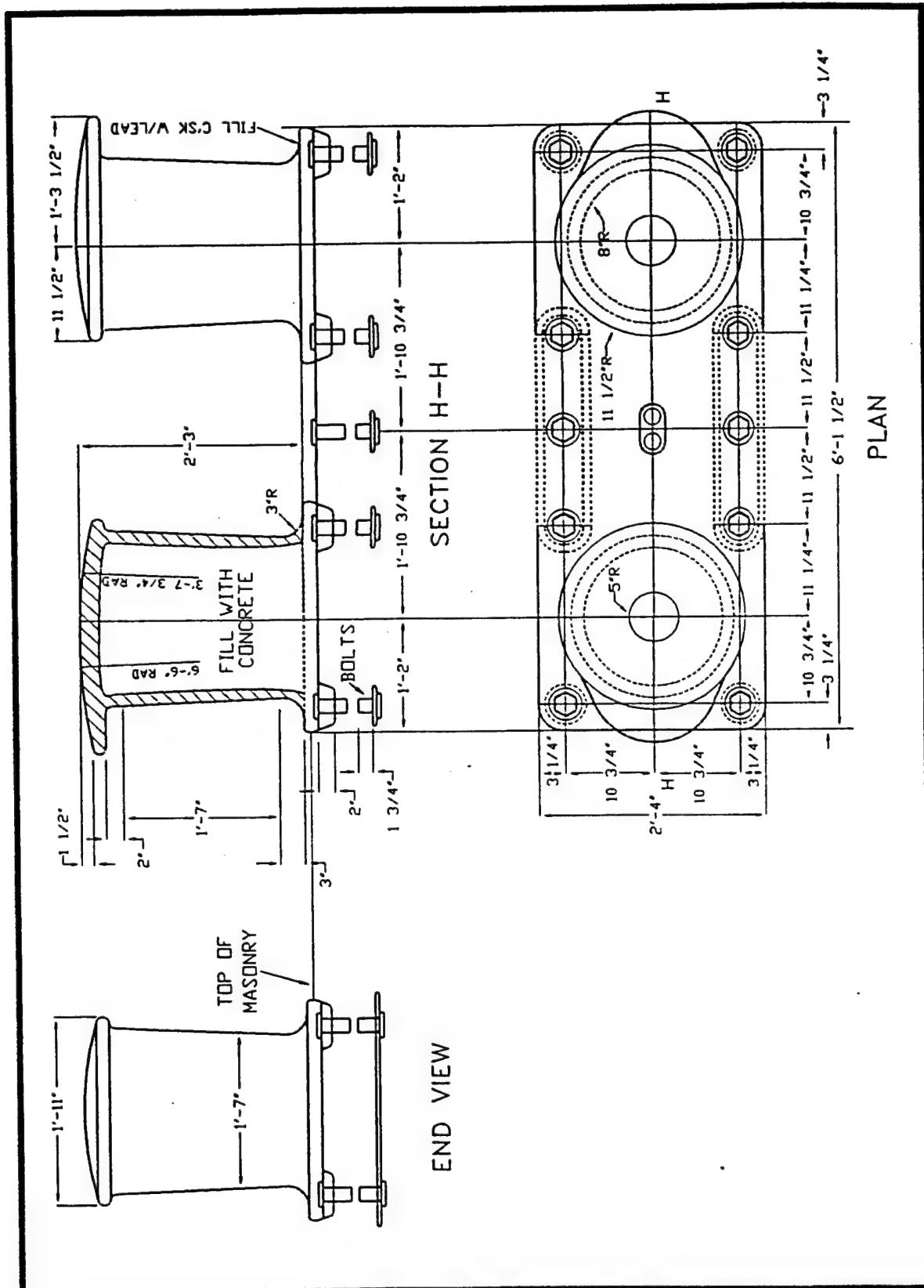
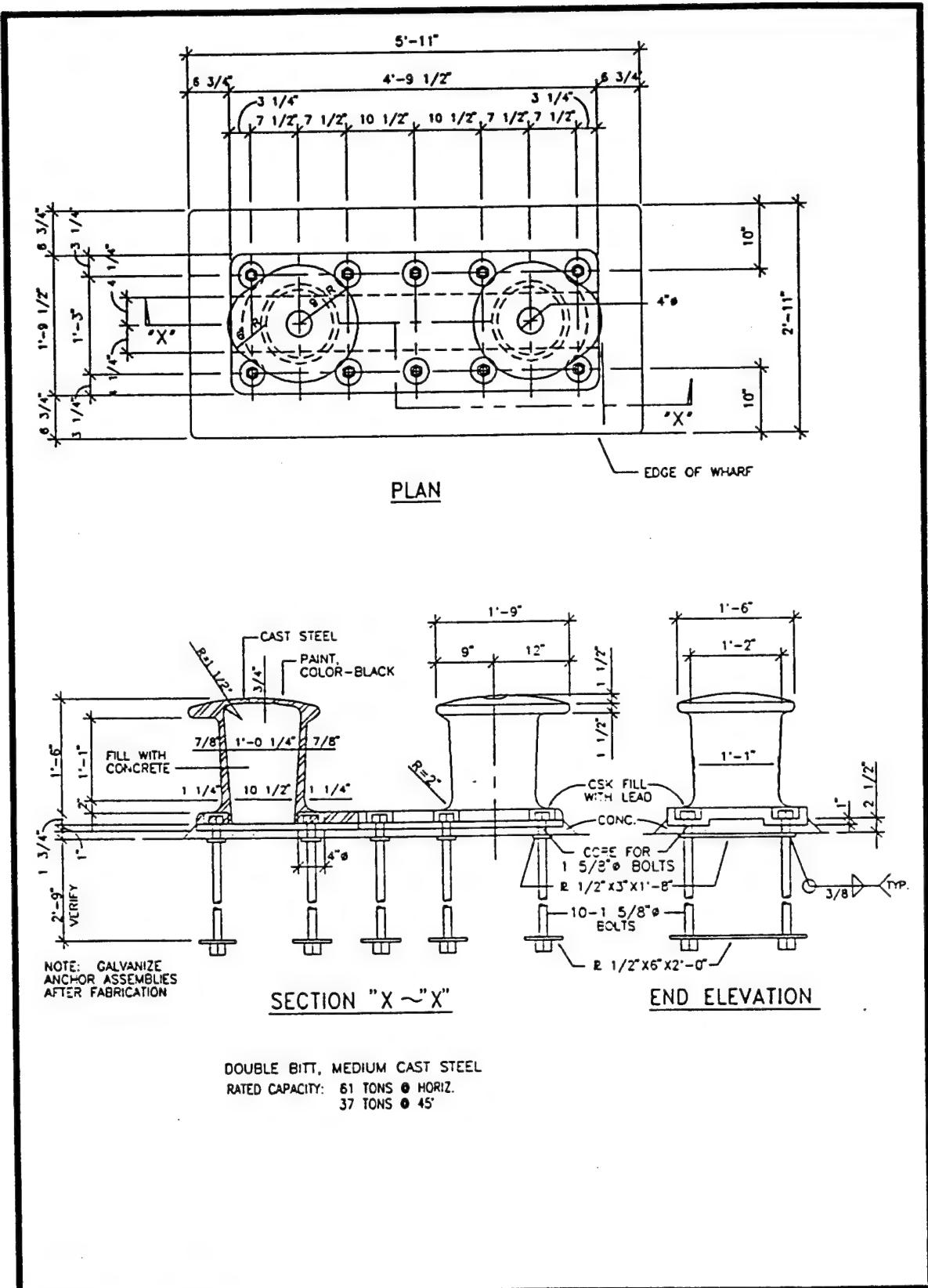


FIGURE 38
Marker Buoy



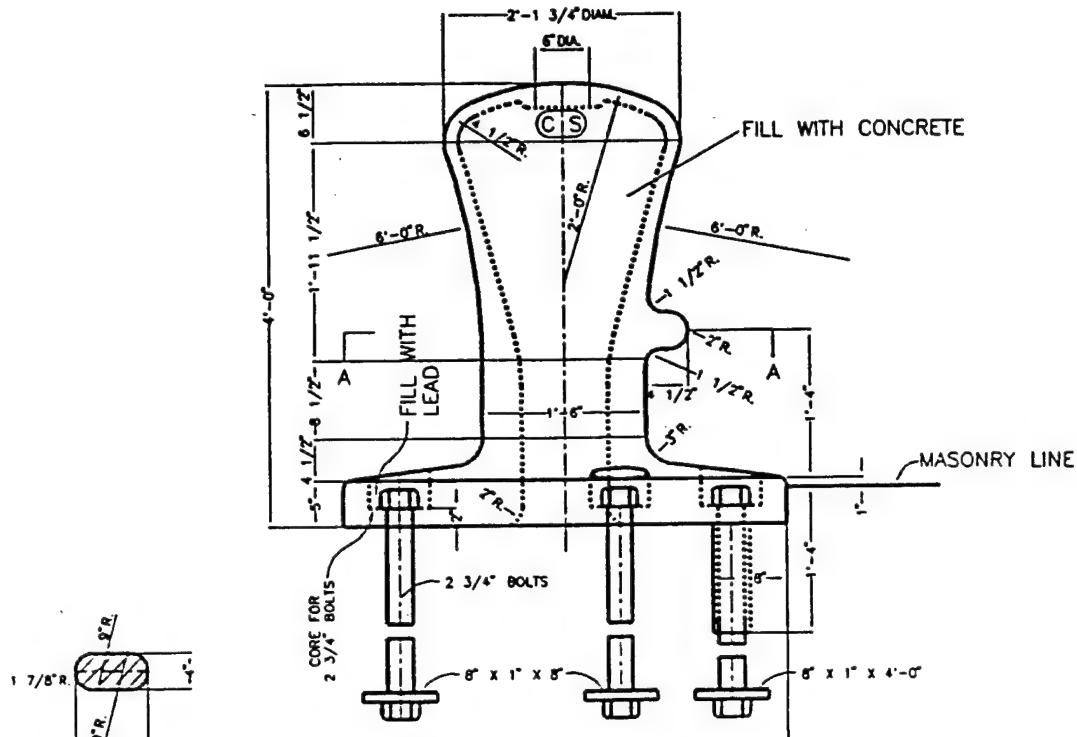
Large Double Bitt With Lip

Capacity 200,000 LBS (new)
Weight 2552 LBS

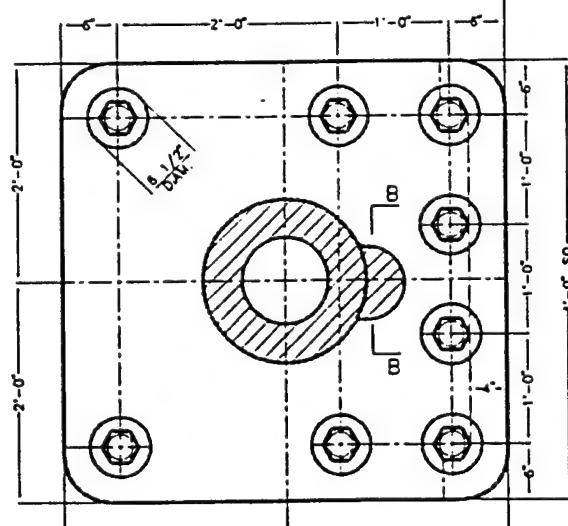


Low Double Bitt With Lip

CAPACITY 60000 LB (NOM)
WEIGHT 1425 LB



SECTION B-B

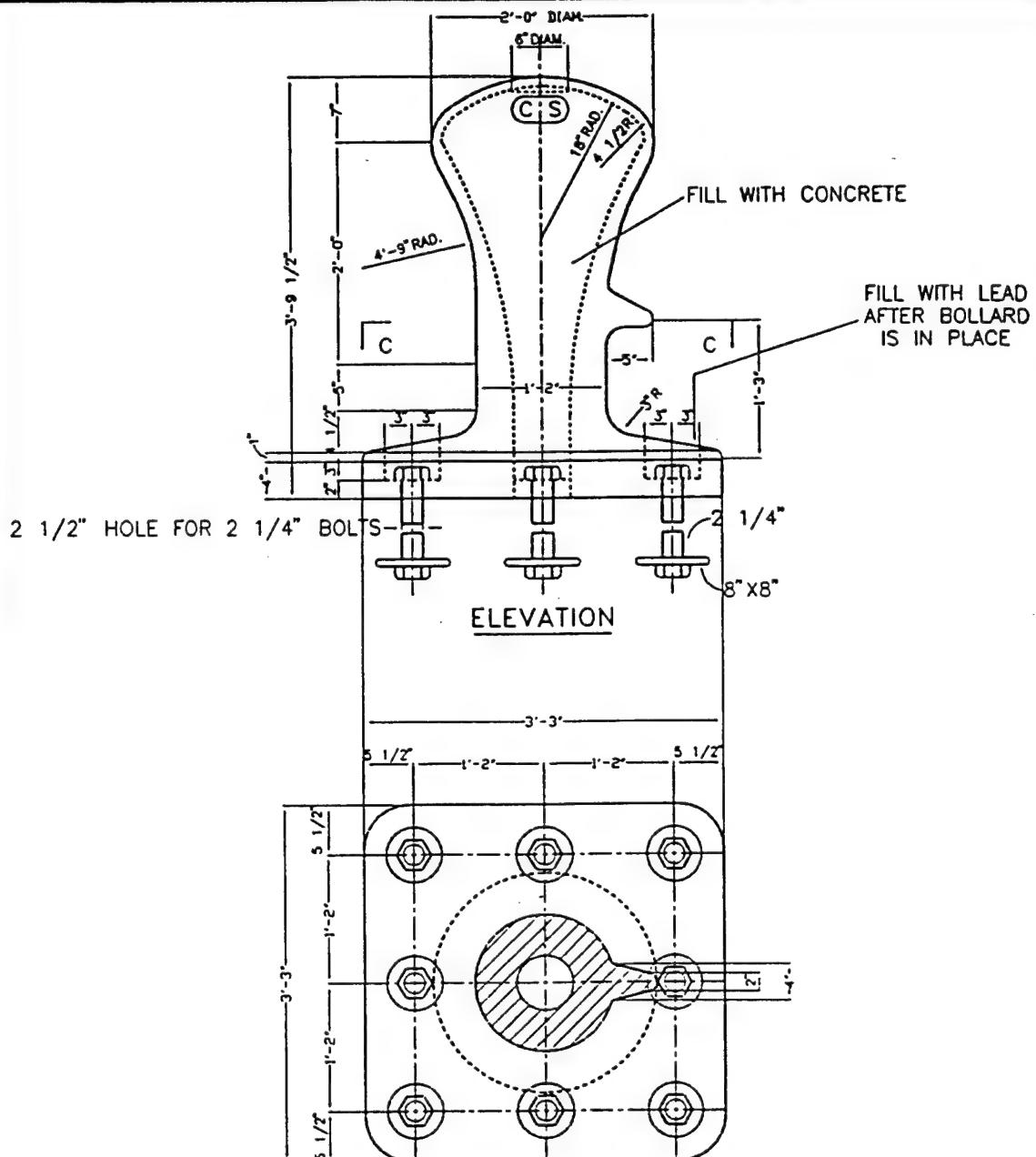


SECTION A-A

Special Mooring Bollard "A"

CAPACITY 450000 LB (NOM)

WEIGHT 5620 LB

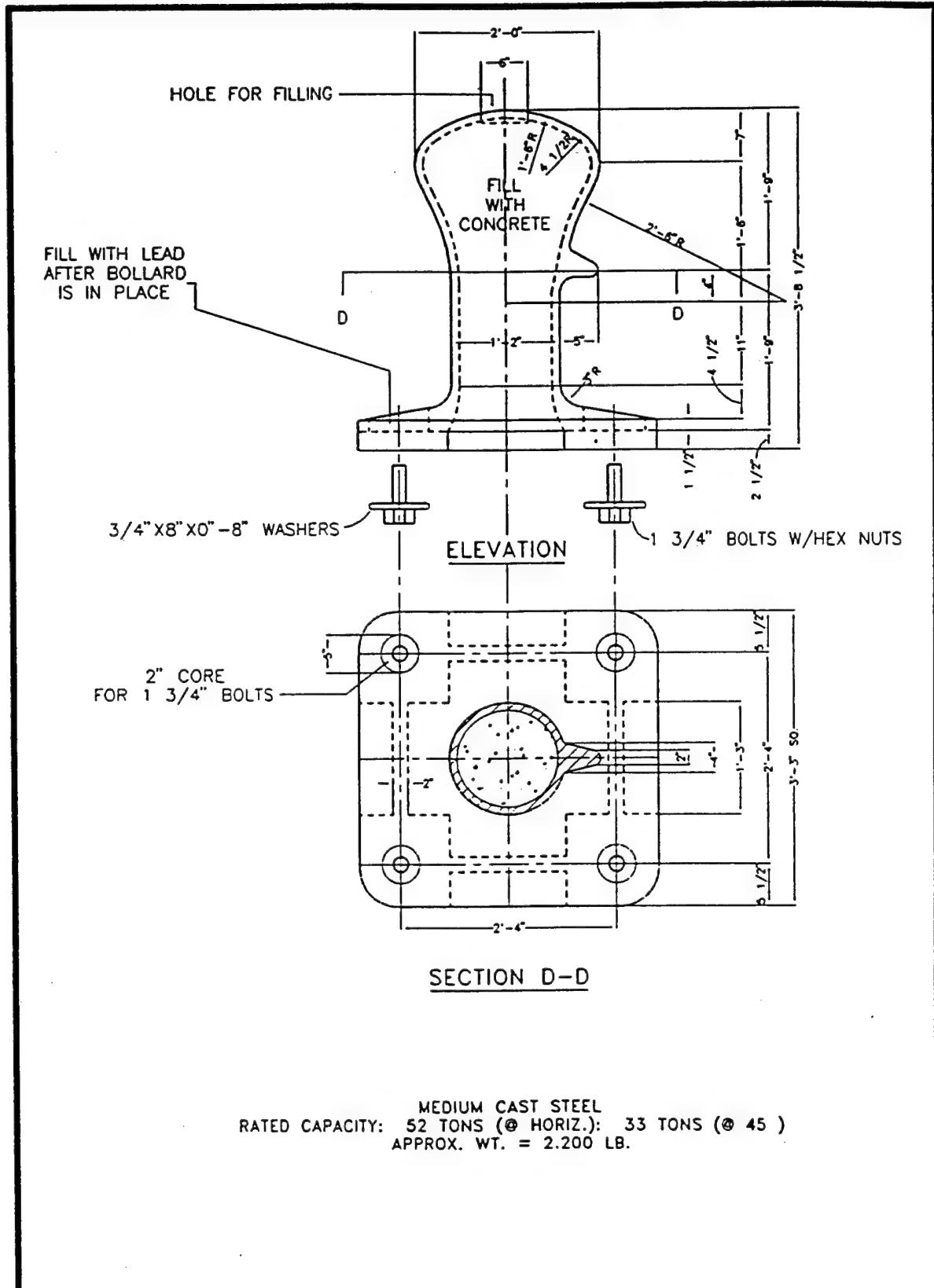


SECTION C-C

CAST STEEL
RATED CAPACITY: 135 TONS (@ HORIZ.): 108 TONS (@ 45°)
APPROX. WT. = 3,570 POUNDS

Special Mooring Bollard "B"

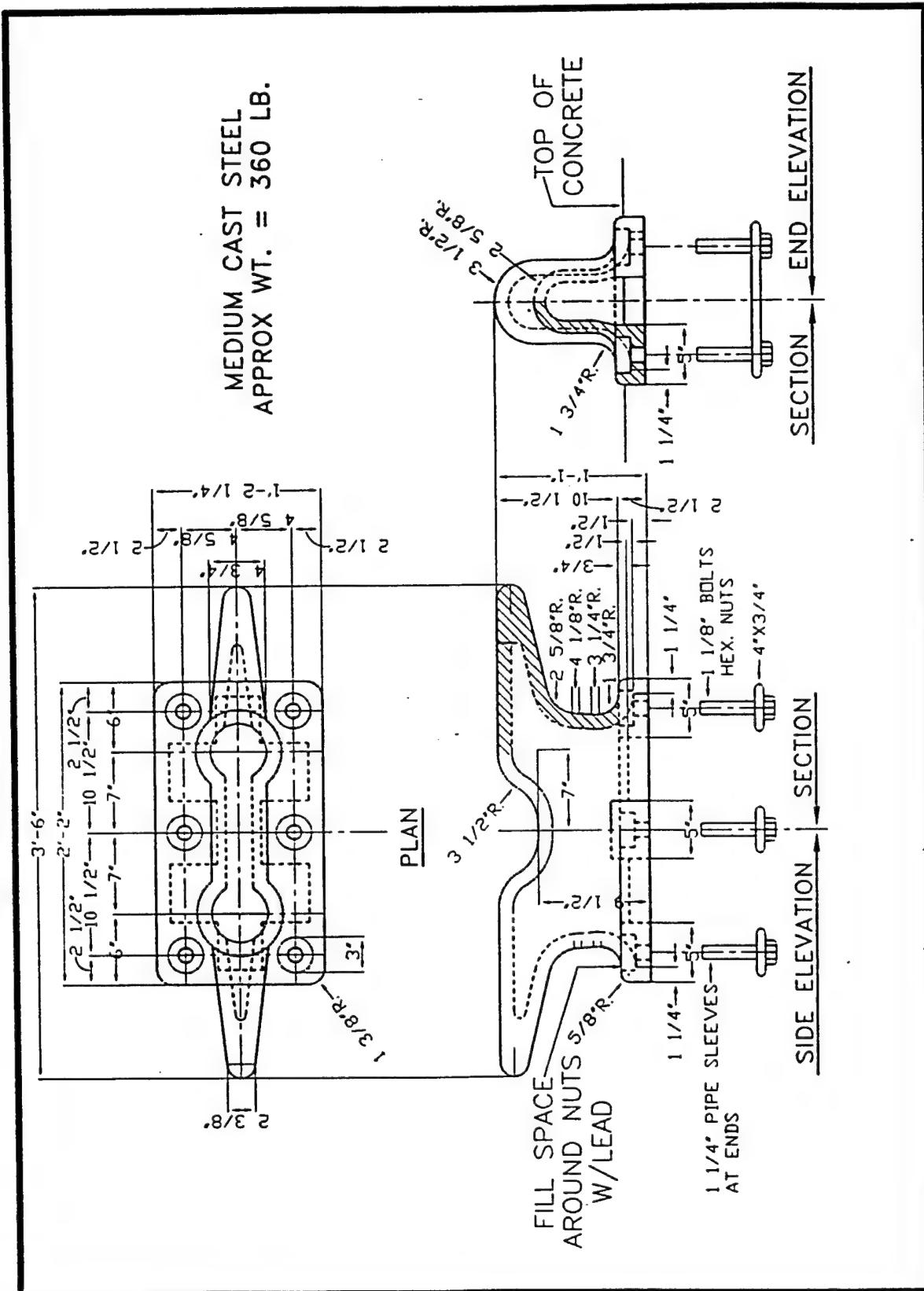
CAPACITY 200000 LB (WUM)
WEIGHT 35 TO LB

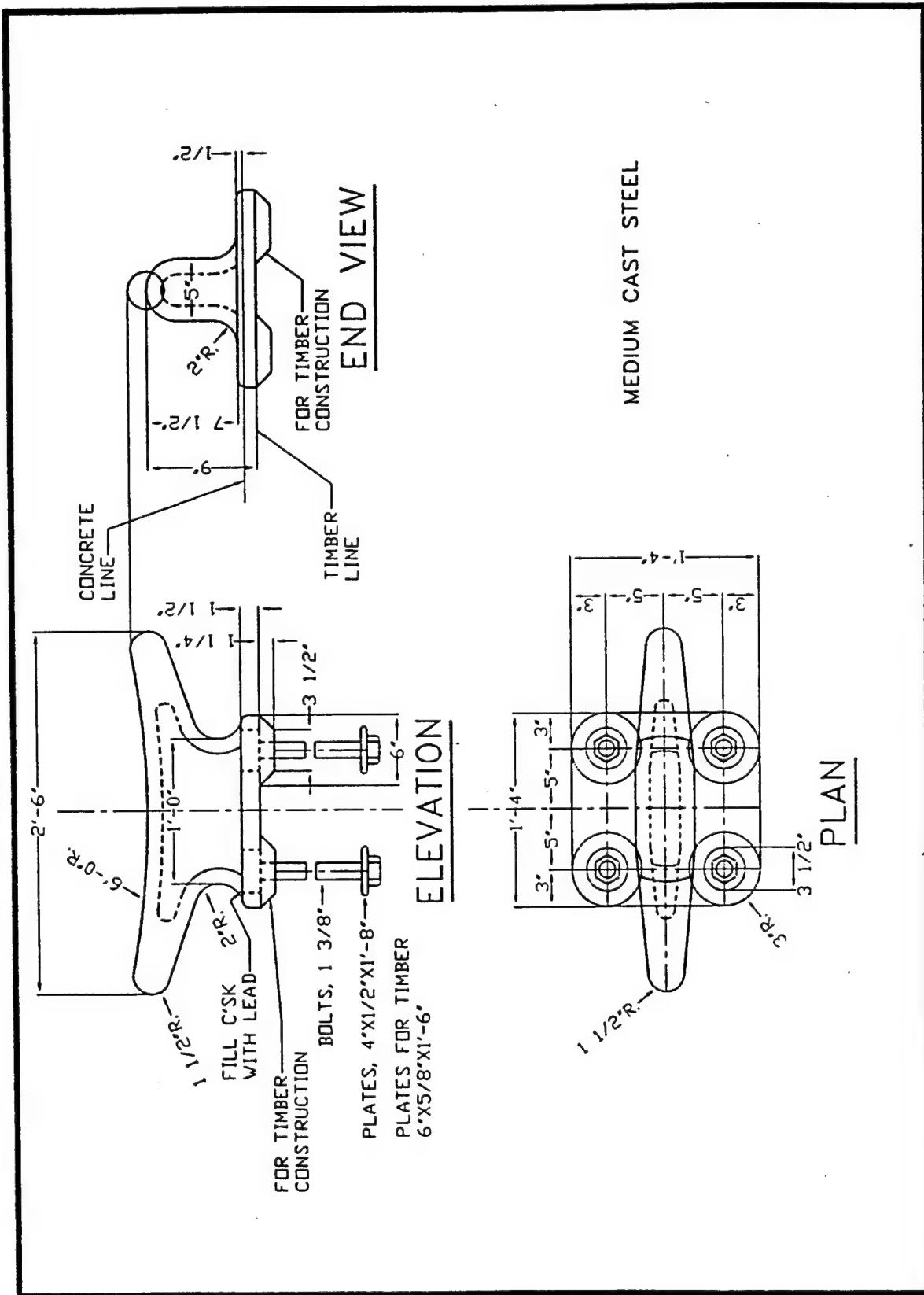


Large Bollard With Horn

CAPACITY 70000 LB (NOM)

WEIGHT 2200 LB





30" Cleat
CAPACITY 2000 lb (mm)

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	C (min)	C (max)	D (min)	E (min)	E (max)	F (min)	G (min)	H (max)
1-3/4	10.50	10.76	2.62	1.75	1.81	1.69	6.21	6.50	1.50	1.41	1.58
2	12.00	12.30	3.00	2.00	2.06	1.94	7.10	7.37	1.65	1.59	1.77
2-1/4	13.50	13.84	3.42	2.25	2.34	2.19	8.04	8.35	1.80	1.59	2.09
2-1/2	15.00	15.38	3.76	2.50	2.59	2.44	8.88	9.20	1.95	1.64	2.23
2-3/4	16.50	16.91	4.12	2.75	2.84	2.79	9.76	10.18	2.10	1.80	2.48
3	18.00	18.45	4.49	3.00	3.09	2.94	10.65	11.05	2.25	1.94	2.62
3-1/2	21.00	21.53	5.25	3.50	3.59	3.38	12.43	12.81	2.40	2.38	3.12
4	24.00	24.60	6.20	4.00	4.10	3.88	14.40	14.78	2.70	2.58	3.58

Note: 'C' dimension is tolerance range for bar stock
 'D' dimension is minimum bar diameter at crown
 'E' dimension does not include flashing at weld

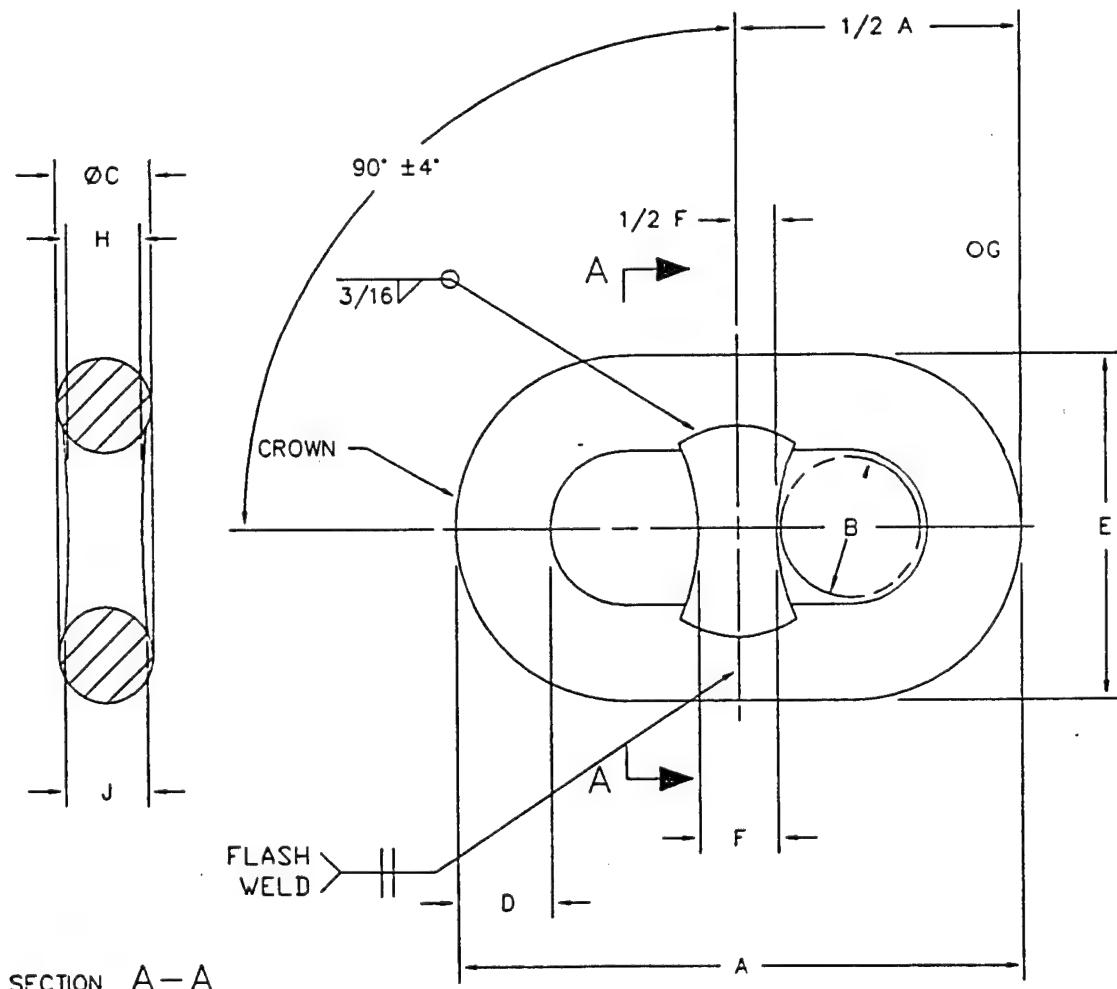


FIGURE 1A
 Common Stud Link Chain

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	E (min)	E (max)	F (min)	F (max)	G (min)	G (max)
1-3/4	11.97	12.03	7.72	7.78	2.33	2.61	1.97	2.03	2.34	2.47	2.47	2.53	1.30	1.33
2	13.47	13.53	8.69	8.75	2.61	2.95	2.22	2.28	2.65	2.78	2.78	2.84	1.45	1.51
2-1/4	14.79	15.03	9.65	9.72	2.90	3.28	2.47	2.53	2.91	3.06	3.06	3.12	1.64	1.67
2-1/2	16.47	16.53	10.78	10.84	3.59	4.03	2.84	2.90	3.25	3.30	3.44	3.50	1.80	1.83
2-3/4	18.34	18.41	11.98	12.03	3.97	4.47	3.16	3.22	3.34	3.40	3.81	3.87	1.89	1.92
3	19.72	19.78	12.84	12.91	4.38	4.62	3.34	3.40	3.47	3.63	4.06	4.17	2.11	2.18
3-1/2	23.22	23.28	14.97	15.03	4.67	5.26	3.84	3.90	4.58	4.72	4.78	4.84	2.61	2.64
4	25.40	25.60	17.34	17.40	6.33	6.67	4.34	4.40	5.22	5.38	5.84	5.91	2.87	2.91

Note:
All Chain Joining Links
Must Be Compatible With
The Common Stud Link Of
The Same Nominal Size

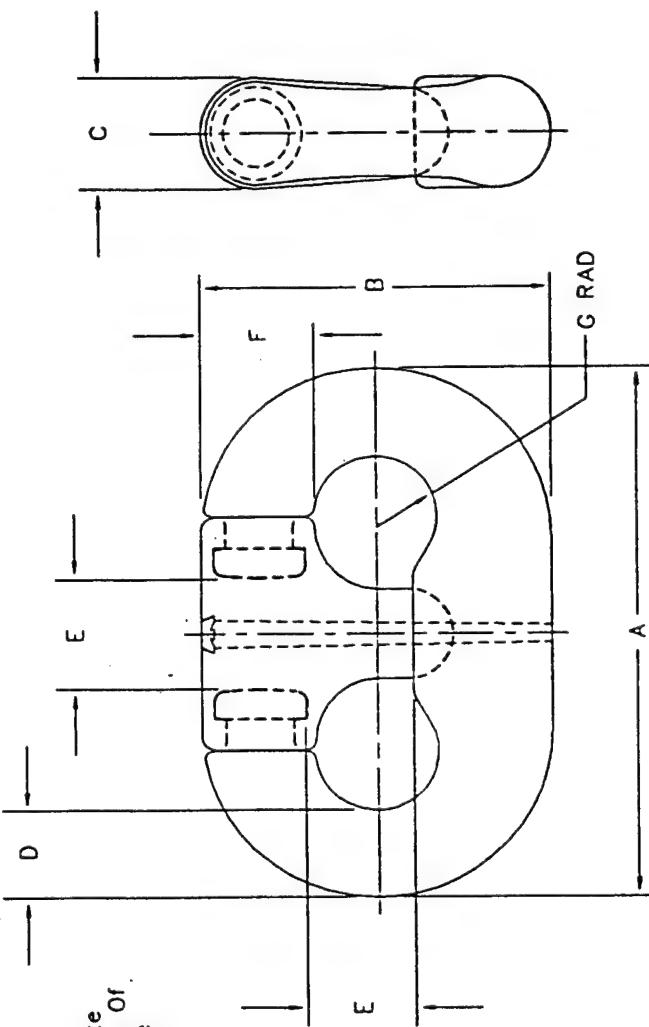
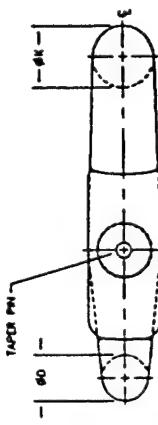
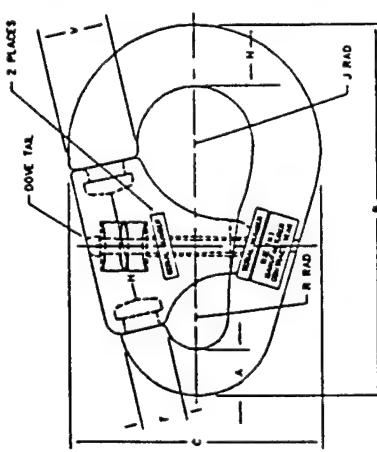


FIGURE 2
Chain Joining Link

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	H (min)	H (max)	J (min)	J (max)
1-3/4	2.03	2.03	14.84	14.90	10.22	10.28	3.00	3.18	3.91	3.97	2.05	2.08
2	2.34	2.41	17.84	17.90	12.28	12.34	3.62	3.86	4.72	4.78	2.51	2.54
2-1/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-1/2	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-3/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
3	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
3-1/2	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
4	4.87	5.12	36.77	37.23	23.75	24.25	7.87	8.12	7.87	8.12	4.25	4.50

Nominal Diameter	N (min)	N (max)	R (min)	R (max)	T (min)	T (max)	T (min)	T (max)	V (min)	V (max)
1-3/4	2.47	2.53	1.23	1.26	2.22	2.34	2.38	2.41	2.87	2.94
2	2.97	3.03	1.45	1.48	2.41	2.84	2.47	2.91	3.44	3.50
2-1/4	3.72	3.78	1.89	1.92	3.09	3.34	3.15	3.41	4.34	4.41
2-1/2	3.72	3.78	1.89	1.92	3.09	3.34	3.15	3.41	4.34	4.41
2-3/4	3.72	3.78	1.89	1.92	3.09	3.34	3.15	3.41	4.34	4.41
3	4.67	5.06	2.11	2.14	3.97	4.34	4.03	4.41	5.09	5.22
3-1/2	4.64	5.06	2.11	2.14	3.97	4.34	4.03	4.41	5.09	5.22
4	6.68	7.06	2.95	3.06	6.00	6.16	7.68	8.06	5.16	5.28



Note: All Anchor Joining Links Must Fit The Common Stud Link and the Ground Ring of the Same Nominal Size. 2-1/4 to 2-3/4 Inch Anchor Joining Links Shall be Tested to the 2-3/4 Inch Requirements and Marked With The Range of 2-1/4 to 2-3/4 Inches. Same Requirement for 3 and 3-1/2 Inch Sizes.

FIGURE 3
Anchor Joining Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)
1-3/4	3.41	3.59	8.78	9.23
2	3.66	3.84	10.24	10.76
2-1/4	5.25	5.50	11.70	12.30
2-1/2	5.25	5.50	11.70	12.30
2-3/4	5.25	5.50	11.70	12.30
3	5.50	5.75	13.16	13.84
3-1/2	5.75	6.00	13.16	13.84
4	7.31	7.69	19.00	19.95

NOTE:

1. 2-1/4 to 2-3/4 inch Ground Rings shall be tested to the 2-3/4 inch requirements and marked with the range of 2-1/4 to 2-3/4.
2. Markings shall be as specified in Section 3.8.

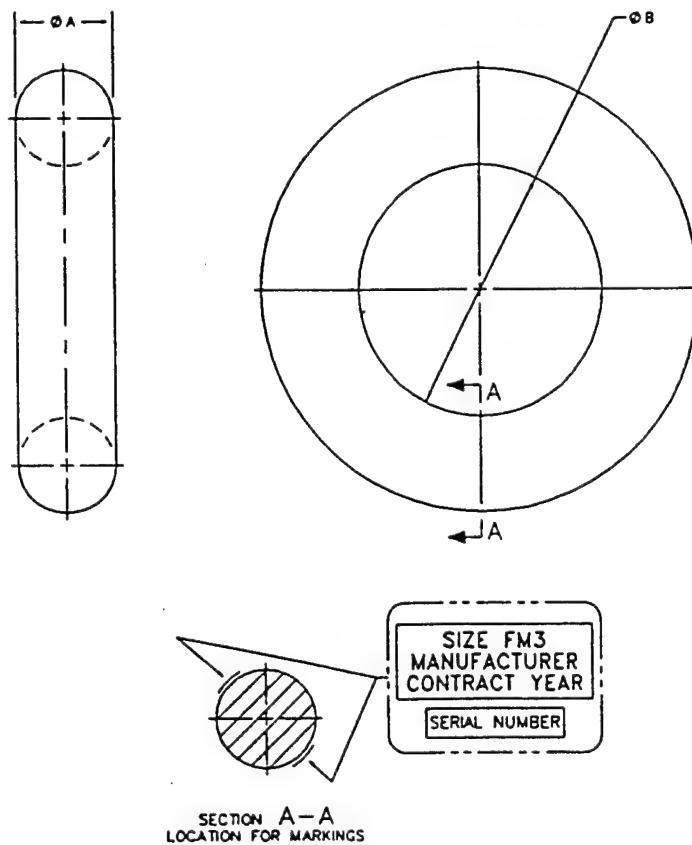


FIGURE 4
Ground Ring

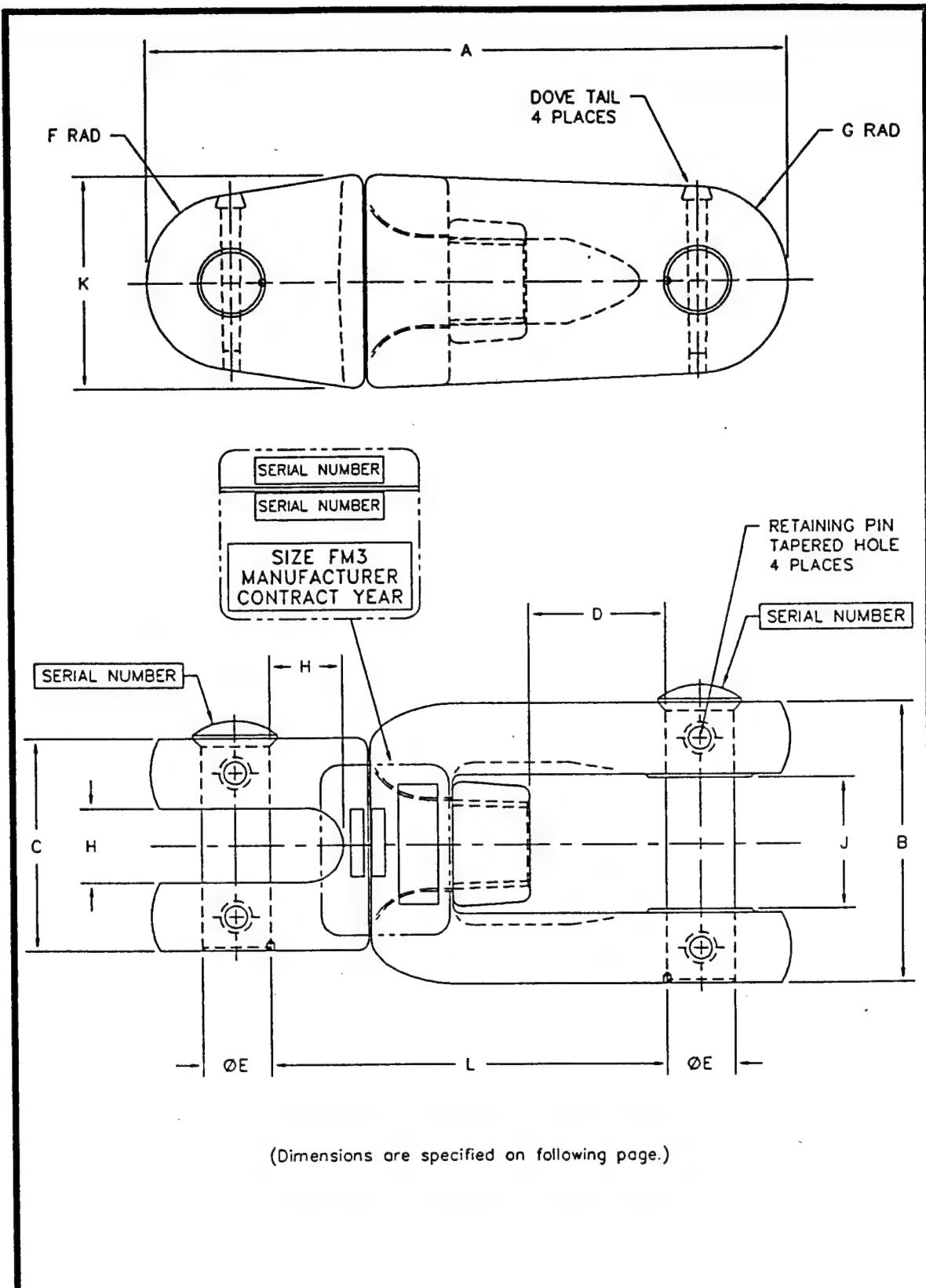


FIGURE 5
Swivel Shackle (Page 1 of 2)

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	E (min)	E (max)	F (min)	F (max)
1-3/4	20.91	22.44	9.07	9.53	6.83	7.18	5.62	2.22	2.34	2.80	2.94	
2	25.36	26.66	11.21	11.79	7.99	8.39	5.62	2.57	2.71	3.29	3.45	
2-1/4	27.44	30.50	12.29	12.92	8.76	9.20	8.00	2.84	2.98	3.61	3.79	
2-1/2	31.89	33.53	13.74	14.44	9.83	10.32	8.00	3.23	3.39	4.07	4.27	
2-3/4	34.09	35.83	15.04	15.82	10.74	11.30	8.00	3.23	3.39	4.42	4.64	
3	38.74	40.72	16.43	17.27	12.05	12.67	9.00	3.76	3.96	4.99	5.25	
3-1/2	45.90	48.26	19.34	20.34	13.82	14.52	9.00	4.45	4.67	5.53	5.81	
4	52.11	54.79	21.96	23.08	15.74	16.54	9.00	4.62	4.87	6.44	6.78	

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	J (min)	J (max)	K (min)	K (max)	P (min)	P (max)
1-3/4	2.99	3.15	2.38	2.50	3.75	4.87	6.83	7.18	12.90	14.75
2	3.69	3.87	2.76	2.90	3.75	4.87	7.99	8.39	15.81	16.63
2-1/4	4.03	4.23	3.07	3.23	3.75	4.87	8.76	9.20	16.97	19.56
2-1/2	4.56	4.80	3.45	3.63	3.75	4.87	9.83	10.33	20.04	21.06
2-3/4	4.95	5.21	3.76	3.96	3.75	4.87	10.74	11.30	21.22	22.31
3	6.03	6.33	4.07	4.27	3.75	4.87	12.05	12.67	23.96	25.18
3-1/2	6.30	6.62	4.84	5.08	3.75	4.87	13.82	14.52	29.63	31.15
4	7.22	7.59	5.53	5.81	3.75	4.87	15.74	16.54	33.39	35.11

Note: Pin diameter to hole diameter looseness shall be +.090 max. for sizes 2-1/2, 2-3/4, 3, 3-1/2, 4, and +.072 max. for sizes 2 1/4, 2, 1 3/4.

FIGURE 5
Swivel Shackle (Page 2 of 2)

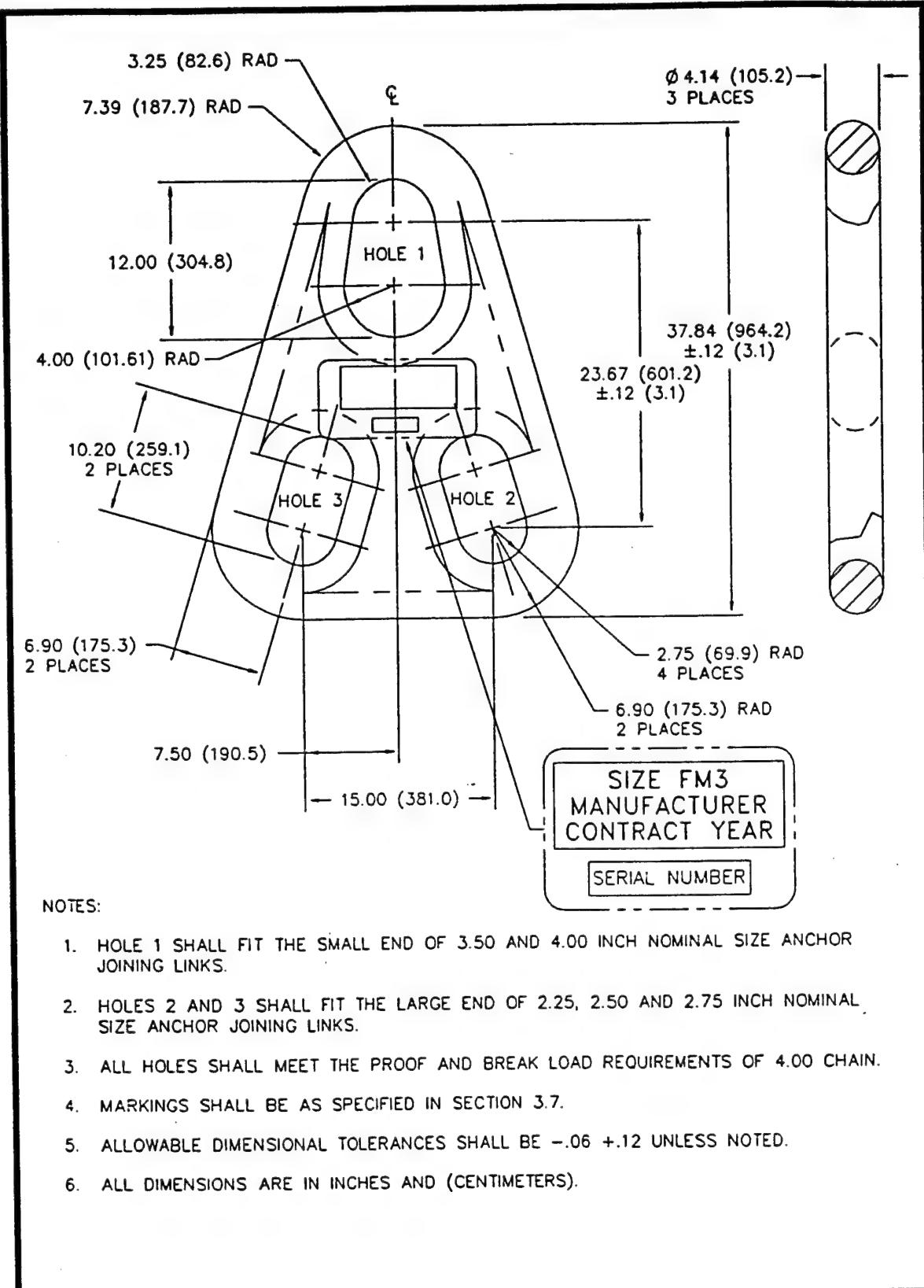
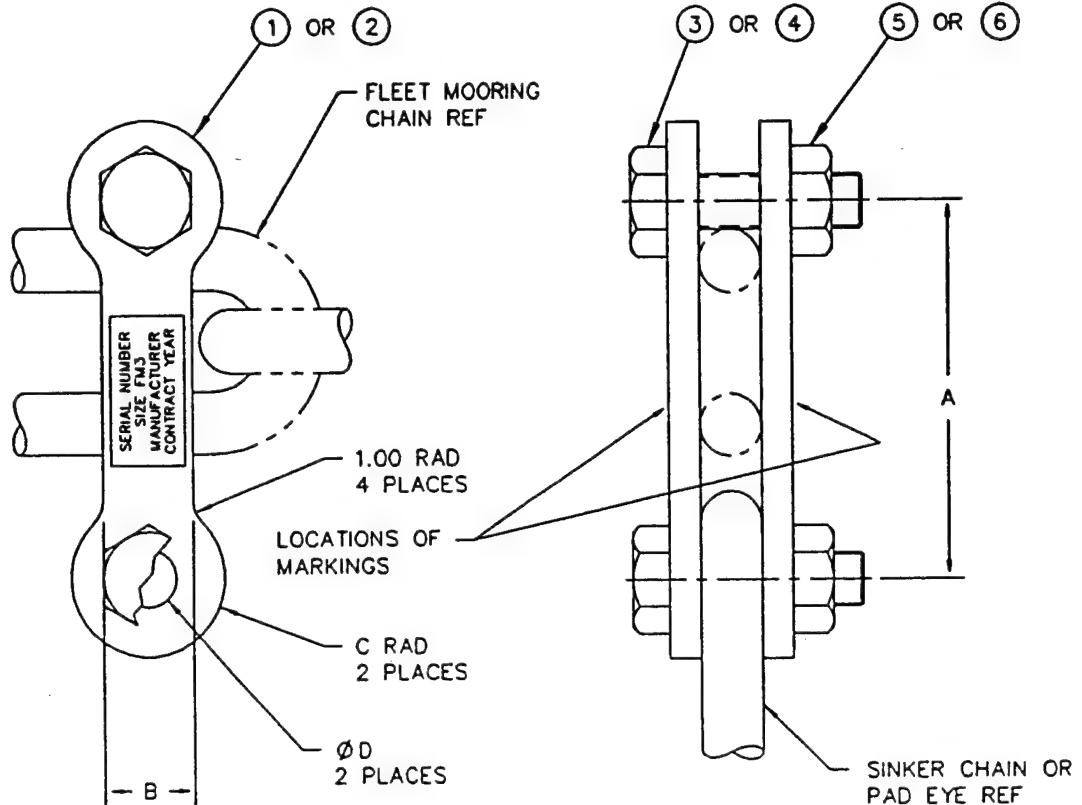


FIGURE 6
Spider Plate



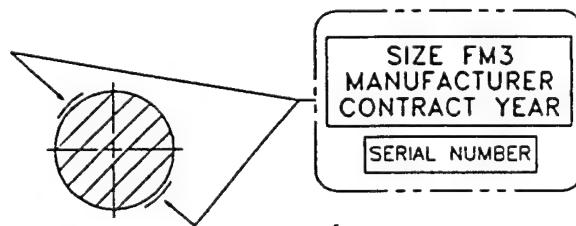
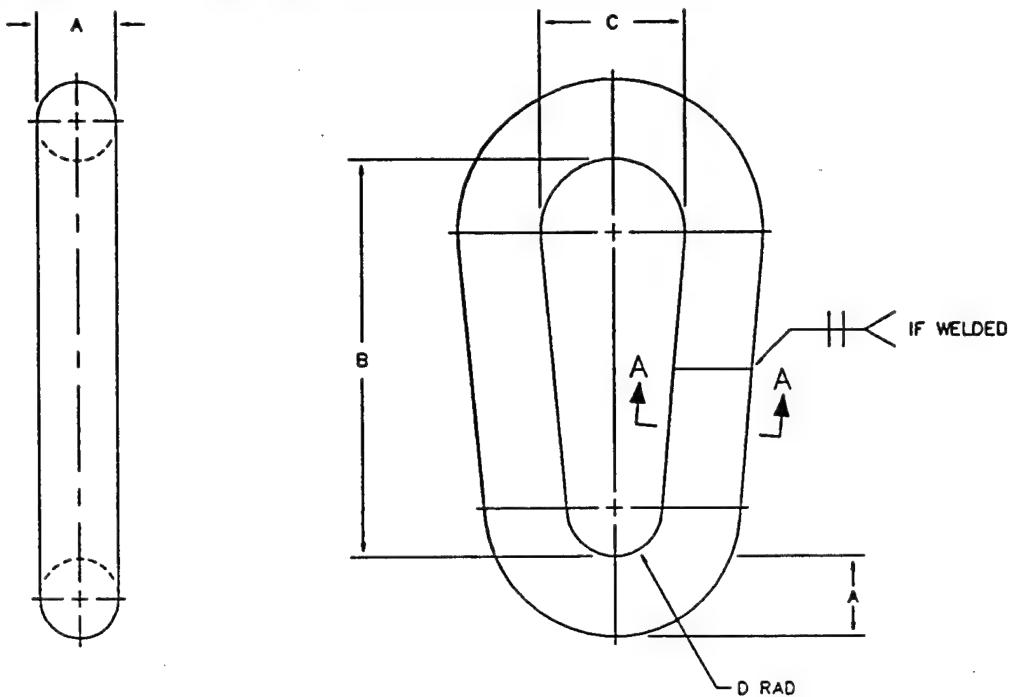
DASH NO.	SINKER CHAIN OR PAD EYE DIA REF	DIM. A	DIM. B	RAD C	DIA D
-1	1 3/4 TO 2	12.06	3.03	2.56	1.88
-2	2 1/4 TO 4	22.06	4.03	3.56	2.38

2	-	6	GRADE DH	NUT, HEAVY, HEX, 2.250-8UN-2B	ASTM A563	STEEL
-	2	5	GRADE DH	NUT, HEAVY, HEX, 1.750-8UN-2B	ASTM A563	STEEL
2	-	4	GRADE BD	BOLT, HEX HD, 2.250-8UN-2A X 9.25L	ASTM A354	STEEL
-	2	3	GRADE BD	BOLT, HEX HD, 1.750-8UN-2A X 6.25L	ASTM A354	STEEL
2	-	2		PLATE, 1.25 STK	ASTM A36	STEEL
-	2	1		PLATE, 1.00 STK	ASTM A36	STEEL
QTY REOD	QTY REQD	FIND NO.	PART OR IDENTIFYING NO.	PART OR IDENTIFYING NO.	SPEC	MATERIAL
-2	-1			PARTS LIST		

NOTES:

1. PLATE SINKER SHACKLE MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 7
Plate Sinker Shackle



SECTION A-A
LOCATION FOR MARKINGS

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)
1-3/4	2.25	2.38	11.50	11.67	4.19	4.32	1.38	1.44
2	2.50	2.63	13.73	14.03	4.91	5.21	1.64	1.74
2-1/4	2.75	2.87	14.50	14.69	5.37	5.50	1.73	1.83
2-1/2	3.00	3.13	16.16	16.34	5.92	6.05	1.92	2.02
2-3/4	3.50	3.63	17.17	17.88	6.47	6.60	2.11	2.21
3	3.75	3.83	19.21	19.33	6.82	7.28	2.28	2.40
3-1/2	4.25	4.33	23.90	24.08	8.77	8.90	2.85	2.79
4	4.75	4.87	26.22	26.40	9.61	9.74	3.13	3.25

NOTES:

1. MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 8
Pear Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)
1-3/4	11.81	12.08	6.91	7.09	2.10	2.16
2	13.50	13.80	7.90	8.10	2.40	2.49
2-1/4	15.19	15.53	8.89	9.13	2.70	2.79
2-1/2	16.88	17.25	9.88	10.13	3.00	3.10
2-3/4	18.56	18.98	10.86	11.14	3.30	3.40
3	20.25	20.70	11.85	12.15	3.60	3.69
3-1/2	23.65	24.15	13.83	14.18	4.20	4.29
4	27.00	27.60	15.80	16.20	4.80	4.89

NOTE:

Markings shall be as specified in Section 3.8.

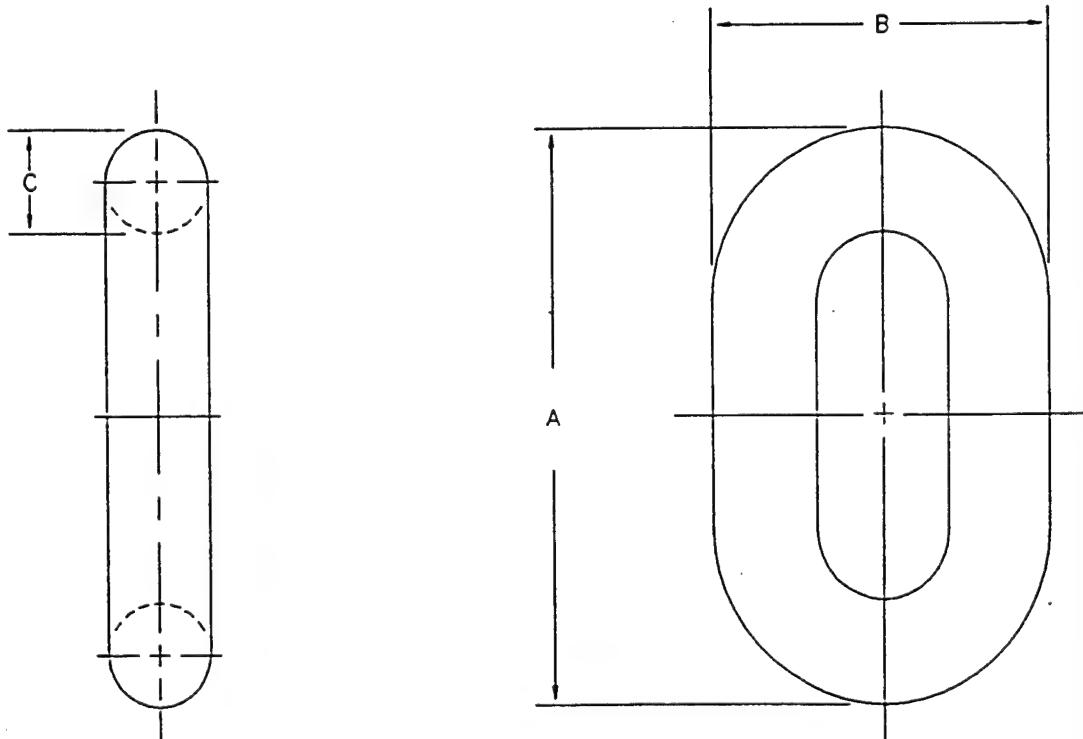


FIGURE 9
End Link

(All Dimensions in Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.22	2.33	5.80	6.10	6.83	7.18	2.73	2.87	4.90
2	2.54	2.67	6.63	6.97	7.80	8.20	3.12	3.28	5.60
2-1/4	2.85	3.00	7.49	7.84	8.78	9.23	3.51	3.69	6.30
2-1/2	3.17	3.33	8.29	8.71	9.75	10.25	3.90	4.10	7.00
2-3/4	3.49	3.66	9.12	9.58	10.73	11.28	4.29	4.51	7.70
3	3.80	4.00	9.95	10.46	11.70	12.30	4.68	4.92	8.40
3-1/2	4.44	4.66	11.60	12.20	13.65	14.35	5.46	5.74	9.80
4	5.07	5.33	13.26	13.94	15.60	16.40	6.24	6.56	11.20

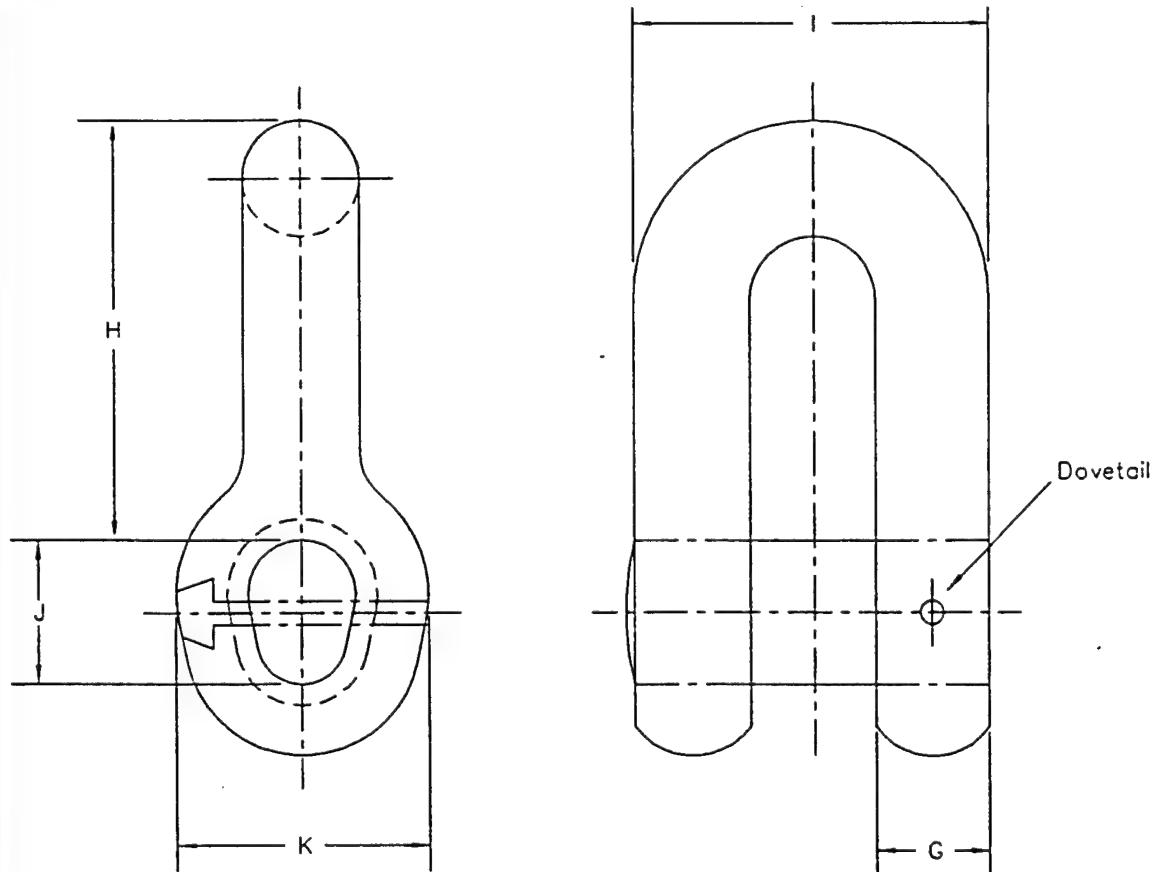


FIGURE 10
Joining Shackle

(All Dimensions in Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.39	2.51	7.85	8.25	8.87	9.33	3.07	3.23	5.43
2	2.73	2.87	8.97	9.43	10.14	10.66	3.51	3.69	6.20
2-1/4	3.07	3.23	10.09	10.61	11.41	11.99	3.95	4.15	6.98
2-1/2	3.14	3.59	11.21	11.79	12.68	13.33	4.39	4.61	7.75
2-3/4	3.75	3.95	12.33	12.97	13.94	14.66	4.38	5.07	8.53
3	4.10	4.31	13.46	14.15	15.21	15.99	5.40	5.54	9.30
3-1/2	4.78	5.02	15.70	16.50	17.75	18.66	6.14	6.46	10.85
4	5.46	5.74	17.94	18.86	20.28	21.32	7.02	7.38	12.40

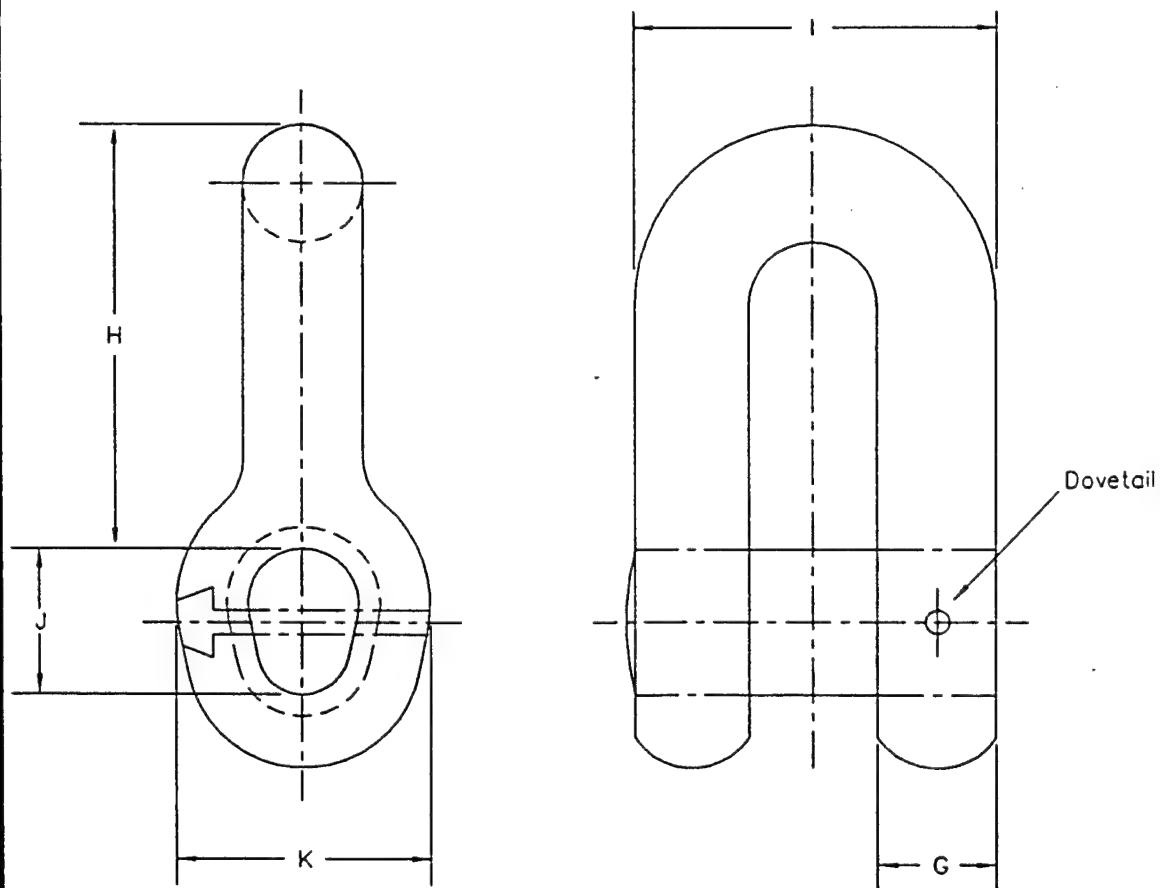
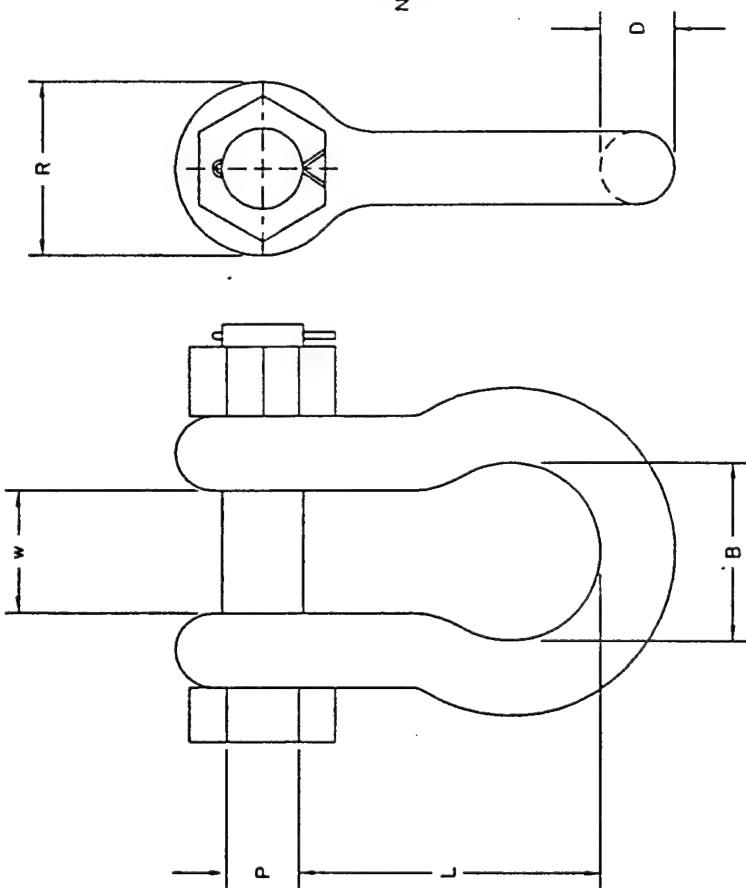


FIGURE 11
Anchor Shackle

(All Dimensions In Inches)

Nominal Diameter	W (min)	W (max)	P (min)	P (max)	R (min)	R (max)	L (min)	L (max)	D (min)	D (max)	B (min)	B (max)	Breaking Load (min pounds)
1-3/8	2.13	2.37	1.46	1.54	3.22	3.40	5.00	5.50	1.32	1.44	3.51	3.75	162,600
1-1/2	2.13	2.50	4.59	1.67	3.54	3.72	5.50	6.00	1.44	1.56	3.76	4.00	204,100
1-3/4	2.76	3.00	1.95	2.05	4.21	4.43	6.75	7.25	1.69	1.81	4.88	5.13	300,000
2	3.13	3.37	2.19	2.31	4.88	5.13	7.50	8.00	1.94	2.06	5.61	5.89	420,000
2-1/2	3.88	4.38	2.68	2.82	5.85	6.15	9.75	11.25	2.55	2.69	7.06	7.44	660,000
3	4.75	5.25	3.17	3.33	6.34	6.66	12.25	13.75	2.93	3.08	7.68	8.08	1,020,000
3-1/2	5.00	5.50	3.66	3.84	7.75	8.25	13.88	15.38	3.41	3.59	8.78	9.23	1,440,500
4	5.25	5.75	4.14	4.36	8.75	9.25	13.75	15.25	3.90	4.10	9.75	10.25	1,800,000



Note: Nominal Sizes Are The Manufacturer's Nomenclature And Do Not Correspond To The Nominal Chain Size; Specific Shackles Will Not Necessarily Have The Same Material And Strength Characteristics As Chain Of The Same Nominal Size. Buoy Shackles Shall Include Bolt, Nut, And Cotter Pin.

FIGURE 12
Buoy Shackle

TABLE 1
Mechanical Properties

Property	Chain and Accessories	Swivel Shackle Pins	Pear Links
Ultimate strength (tensile) minimum maximum	93,000 psi 115,000 psi	145,000 psi 170,000 psi	150,000 psi
Elongation minimum (gage length = 5X specimen diameter)	17 percent	12 percent	9 percent
Reduction in area minimum	40 percent	40 percent	22 percent
Brinell Hardness (standard ball: 10mm ball and 3000 Kg load) chain accessories	192-229 192-235	321 - 365	300 - 370
Impact; average of three specimens at 32F (minimum) base metal across weld cast components	43 ft lb 36 ft lb 30 ft lb	43 ft lb	30 ft lb 26 ft lb 15 ft lb

TABLE 2
Physical Properties of Finished Chain and Accessories

Chain Diameter (inches)	Proof Load (lbs)	Minimum Breaking Load (lbs)	Minimum Chain Weight per Shot (lbs)
1-3/4	247,000	352,000	2252
2	318,000	454,000	3276
2-1/4	396,000	570,000	4143
2-1/2	484,000	692,000	5138
2-3/4	578,000	826,000	6250
3	679,000	970,000	7459
3-1/2	900,000	1,285,000	10258
4	1,143,000	1,632,000	13358

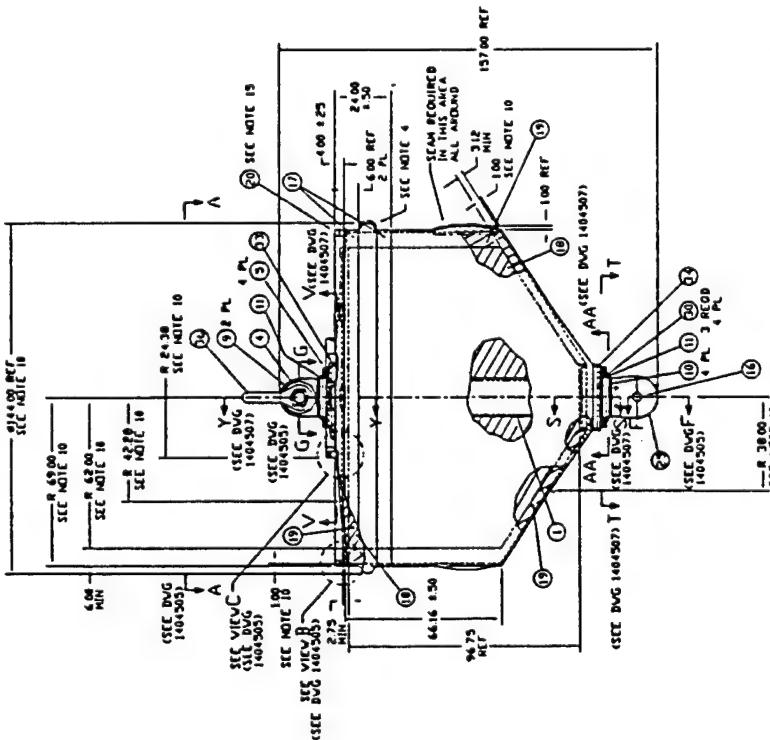
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No.	Name	Age	Gender	Address	Physical Examination		Medical History		Social History		Family History		Habits		Other		
					Height	Weight	BP	Pulse	Respiratory	Stool	Urine	Alcohol	Smoking	Drugs	Family	Occupation	Exercise
1	John Doe	35	M	123 Main St, Anytown, USA	5'10"	180 lbs	120/80	60	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Office Worker	Office Work
2	Jane Smith	28	F	456 Elm St, Anytown, USA	5'5"	130 lbs	110/70	55	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Homemaker	Household Chores
3	Mike Johnson	42	M	789 Oak St, Anytown, USA	5'9"	170 lbs	130/85	65	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Construction Worker	Physical Work
4	Sarah Williams	38	F	567 Pine St, Anytown, USA	5'4"	140 lbs	115/75	58	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Waitress	Service Work
5	David Lee	25	M	987 Cedar St, Anytown, USA	5'7"	160 lbs	125/80	62	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
6	Emily Davis	32	F	234 Cedar St, Anytown, USA	5'6"	150 lbs	118/72	56	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
7	Robert Green	45	M	789 Elm St, Anytown, USA	5'11"	190 lbs	140/90	70	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
8	Sarah Brown	30	F	456 Cedar St, Anytown, USA	5'7"	145 lbs	112/70	54	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
9	Michael White	22	M	987 Elm St, Anytown, USA	5'8"	155 lbs	122/82	64	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
10	Elizabeth Green	37	F	234 Elm St, Anytown, USA	5'5"	148 lbs	114/74	57	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
11	Christopher Black	48	M	789 Cedar St, Anytown, USA	5'10"	185 lbs	135/85	72	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
12	Sarah Johnson	34	F	456 Cedar St, Anytown, USA	5'6"	142 lbs	116/71	55	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
13	David Lee	26	M	987 Elm St, Anytown, USA	5'7"	158 lbs	124/81	63	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
14	Emily Davis	31	F	234 Elm St, Anytown, USA	5'5"	144 lbs	113/73	56	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
15	Robert Green	46	M	789 Cedar St, Anytown, USA	5'11"	188 lbs	138/86	71	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
16	Sarah Brown	31	F	456 Elm St, Anytown, USA	5'7"	146 lbs	115/72	54	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
17	Michael White	23	M	987 Elm St, Anytown, USA	5'8"	156 lbs	123/83	65	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
18	Elizabeth Green	38	F	234 Elm St, Anytown, USA	5'5"	149 lbs	117/74	57	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
19	Christopher Black	49	M	789 Cedar St, Anytown, USA	5'10"	187 lbs	137/85	73	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
20	Sarah Johnson	35	F	456 Cedar St, Anytown, USA	5'6"	143 lbs	117/71	55	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
21	David Lee	27	M	987 Elm St, Anytown, USA	5'7"	159 lbs	125/82	66	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
22	Emily Davis	32	F	234 Elm St, Anytown, USA	5'5"	147 lbs	118/73	56	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
23	Robert Green	50	M	789 Cedar St, Anytown, USA	5'11"	189 lbs	139/86	74	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
24	Sarah Brown	32	F	456 Elm St, Anytown, USA	5'7"	145 lbs	116/72	54	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
25	Michael White	24	M	987 Elm St, Anytown, USA	5'8"	157 lbs	126/83	67	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
26	Elizabeth Green	39	F	234 Elm St, Anytown, USA	5'5"	150 lbs	120/75	58	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
27	Christopher Black	51	M	789 Cedar St, Anytown, USA	5'10"	191 lbs	141/87	75	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
28	Sarah Johnson	36	F	456 Cedar St, Anytown, USA	5'6"	141 lbs	119/71	53	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
29	David Lee	28	M	987 Elm St, Anytown, USA	5'7"	161 lbs	127/84	69	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
30	Emily Davis	33	F	234 Elm St, Anytown, USA	5'5"	148 lbs	121/76	57	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
31	Robert Green	52	M	789 Cedar St, Anytown, USA	5'11"	193 lbs	143/88	76	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
32	Sarah Brown	33	F	456 Elm St, Anytown, USA	5'7"	146 lbs	122/73	55	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
33	Michael White	25	M	987 Elm St, Anytown, USA	5'8"	158 lbs	128/85	70	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
34	Elizabeth Green	40	F	234 Elm St, Anytown, USA	5'5"	152 lbs	124/77	60	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
35	Christopher Black	53	M	789 Cedar St, Anytown, USA	5'10"	195 lbs	145/89	77	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
36	Sarah Johnson	37	F	456 Cedar St, Anytown, USA	5'6"	143 lbs	120/71	52	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
37	David Lee	29	M	987 Elm St, Anytown, USA	5'7"	162 lbs	129/86	71	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
38	Emily Davis	34	F	234 Elm St, Anytown, USA	5'5"	151 lbs	123/78	59	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
39	Robert Green	54	M	789 Cedar St, Anytown, USA	5'11"	197 lbs	147/90	78	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
40	Sarah Brown	34	F	456 Elm St, Anytown, USA	5'7"	147 lbs	125/73	56	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
41	Michael White	26	M	987 Elm St, Anytown, USA	5'8"	159 lbs	130/87	68	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
42	Elizabeth Green	41	F	234 Elm St, Anytown, USA	5'5"	154 lbs	126/80	61	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
43	Christopher Black	55	M	789 Cedar St, Anytown, USA	5'10"	199 lbs	148/91	79	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
44	Sarah Johnson	38	F	456 Cedar St, Anytown, USA	5'6"	144 lbs	121/71	53	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
45	David Lee	30	M	987 Elm St, Anytown, USA	5'7"	164 lbs	131/88	72	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
46	Emily Davis	35	F	234 Elm St, Anytown, USA	5'5"	152 lbs	127/79	60	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
47	Robert Green	56	M	789 Cedar St, Anytown, USA	5'11"	201 lbs	149/92	80	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
48	Sarah Brown	35	F	456 Elm St, Anytown, USA	5'7"	149 lbs	128/73	57	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
49	Michael White	27	M	987 Elm St, Anytown, USA	5'8"	161 lbs	132/89	69	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
50	Elizabeth Green	42	F	234 Elm St, Anytown, USA	5'5"	156 lbs	129/81	62	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
51	Christopher Black	57	M	789 Cedar St, Anytown, USA	5'10"	203 lbs	150/94	81	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
52	Sarah Johnson	39	F	456 Cedar St, Anytown, USA	5'6"	145 lbs	122/71	54	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
53	David Lee	31	M	987 Elm St, Anytown, USA	5'7"	166 lbs	133/91	73	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
54	Emily Davis	36	F	234 Elm St, Anytown, USA	5'5"	154 lbs	130/80	65	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
55	Robert Green	58	M	789 Cedar St, Anytown, USA	5'11"	205 lbs	151/95	82	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
56	Sarah Brown	36	F	456 Elm St, Anytown, USA	5'7"	151 lbs	131/73	58	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
57	Michael White	28	M	987 Elm St, Anytown, USA	5'8"	163 lbs	134/92	70	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
58	Elizabeth Green	43	F	234 Elm St, Anytown, USA	5'5"	157 lbs	132/81	63	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
59	Christopher Black	59	M	789 Cedar St, Anytown, USA	5'10"	207 lbs	153/96	83	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
60	Sarah Johnson	40	F	456 Cedar St, Anytown, USA	5'6"	146 lbs	123/71	55	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
61	David Lee	32	M	987 Elm St, Anytown, USA	5'7"	168 lbs	135/93	74	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
62	Emily Davis	37	F	234 Elm St, Anytown, USA	5'5"	155 lbs	133/80	66	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
63	Robert Green	60	M	789 Cedar St, Anytown, USA	5'11"	209 lbs	154/97	84	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
64	Sarah Brown	37	F	456 Elm St, Anytown, USA	5'7"	152 lbs	134/73	59	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
65	Michael White	29	M	987 Elm St, Anytown, USA	5'8"	165 lbs	136/92	71	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
66	Elizabeth Green	44	F	234 Elm St, Anytown, USA	5'5"	158 lbs	135/81	67	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
67	Christopher Black	61	M	789 Cedar St, Anytown, USA	5'10"	211 lbs	156/98	85	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
68	Sarah Johnson	41	F	456 Cedar St, Anytown, USA	5'6"	147 lbs	124/71	56	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
69	David Lee	33	M	987 Elm St, Anytown, USA	5'7"	170 lbs	137/94	75	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
70	Emily Davis	38	F	234 Elm St, Anytown, USA	5'5"	156 lbs	136/83	68	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
71	Robert Green	62	M	789 Cedar St, Anytown, USA	5'11"	213 lbs	157/99	86	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
72	Sarah Brown	38	F	456 Elm St, Anytown, USA	5'7"	153 lbs	135/73	61	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
73	Michael White	30	M	987 Elm St, Anytown, USA	5'8"	167 lbs	138/92	72	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
74	Elizabeth Green	45	F	234 Elm St, Anytown, USA	5'5"	159 lbs	137/81	69	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
75	Christopher Black	63	M	789 Cedar St, Anytown, USA	5'10"	215 lbs	158/100	87	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
76	Sarah Johnson	42	F	456 Cedar St, Anytown, USA	5'6"	148 lbs	125/71	57	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
77	David Lee	34	M	987 Elm St, Anytown, USA	5'7"	172 lbs	139/95	76	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work
78	Emily Davis	39	F	234 Elm St, Anytown, USA	5'5"	157 lbs	138/84	70	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
79	Robert Green	64	M	789 Cedar St, Anytown, USA	5'11"	217 lbs	159/101	88	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Plumber	Physical Work
80	Sarah Brown	39	F	456 Elm St, Anytown, USA	5'7"	154 lbs	137/73	62	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Customer Service	Office Work
81	Michael White	31	M	987 Elm St, Anytown, USA	5'8"	170 lbs	140/93	73	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Delivery Driver	Physical Work
82	Elizabeth Green	46	F	234 Elm St, Anytown, USA	5'5"	160 lbs	141/82	67	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Teacher	Office Work
83	Christopher Black	65	M	789 Cedar St, Anytown, USA	5'10"	219 lbs	160/102	89	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Police Officer	Physical Work
84	Sarah Johnson	43	F	456 Cedar St, Anytown, USA	5'6"	150 lbs	126/71	58	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Administrative Assistant	Office Work
85	David Lee	35	M	987 Elm St, Anytown, USA	5'7"	174 lbs	142/96	77	Normal	Normal	Normal	Negative	Negative	Negative	Positive	Software Developer	Office Work</

**Foam Filled Mooring Buoy
Polyurethane, 8 Ft. Diameter, Class AA**

17. USE OF PRIVATE SPACES AND PRIVATE AREAS IN PUBLIC
RECENTLY
MADE IT
POSSIBLE



Foam Filled Mooring Buoy
Polyurethane, 11.5 Ft. Diameter, Class AA

TABLE E-1
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at approximately 45°

Seafloor Type: Mud

Horizontal Design Load (kips)

25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

Anchor
Weight
(Kips)

| | | | | | | | | | | | | | |
|-----|-----|------|------|------|------|---|---|---|---|---|---|---|---|
| 6. | 54. | * | * | * | * | * | * | * | * | * | * | * | * |
| 7. | 32. | * | * | * | * | * | * | * | * | * | * | * | * |
| 8. | 21. | * | * | * | * | * | * | * | * | * | * | * | * |
| 9. | 13. | * | * | * | * | * | * | * | * | * | * | * | * |
| 10. | 9. | * | * | * | * | * | * | * | * | * | * | * | * |
| 11. | 6. | 183. | * | * | * | * | * | * | * | * | * | * | * |
| 12. | 6. | 99. | * | * | * | * | * | * | * | * | * | * | * |
| 13. | 6. | 64. | * | * | * | * | * | * | * | * | * | * | * |
| 14. | 5. | 47. | * | * | * | * | * | * | * | * | * | * | * |
| 15. | 5. | 40. | * | * | * | * | * | * | * | * | * | * | * |
| 16. | 5. | 33. | * | * | * | * | * | * | * | * | * | * | * |
| 17. | 4. | 27. | * | * | * | * | * | * | * | * | * | * | * |
| 18. | 4. | 22. | 154. | * | * | * | * | * | * | * | * | * | * |
| 19. | 4. | 17. | 95. | * | * | * | * | * | * | * | * | * | * |
| 20. | 3. | 14. | 77. | * | * | * | * | * | * | * | * | * | * |
| 21. | 3. | 12. | 64. | * | * | * | * | * | * | * | * | * | * |
| 22. | 2. | 10. | 53. | * | * | * | * | * | * | * | * | * | * |
| 23. | 2. | 8. | 48. | * | * | * | * | * | * | * | * | * | * |
| 24. | 2. | 8. | 42. | 202. | * | * | * | * | * | * | * | * | * |
| 25. | 1. | 8. | 37. | 152. | * | * | * | * | * | * | * | * | * |
| 26. | 1. | 8. | 33. | 104. | * | * | * | * | * | * | * | * | * |
| 27. | 1. | 7. | 29. | 89. | * | * | * | * | * | * | * | * | * |
| 28. | 1. | 7. | 25. | 78. | * | * | * | * | * | * | * | * | * |
| 29. | 1. | 7. | 21. | 68. | * | * | * | * | * | * | * | * | * |
| 30. | 0. | 7. | 19. | 59. | 245. | * | * | * | * | * | * | * | * |

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at approximately 36°

Seafloor Type: Sand

Horizontal Design Load (kips)

25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

**Anchor
Weight
(Kips)**

| | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|---|---|---|---|---|---|---|
| 5. | 20. | * | * | * | * | * | * | * | * | * | * | * | * |
| 6. | 19. | * | * | * | * | * | * | * | * | * | * | * | * |
| 7. | 18. | 37. | * | * | * | * | * | * | * | * | * | * | * |
| 8. | 17. | 33. | * | * | * | * | * | * | * | * | * | * | * |
| 9. | 17. | 29. | * | * | * | * | * | * | * | * | * | * | * |
| 10. | 17. | 28. | * | * | * | * | * | * | * | * | * | * | * |
| 11. | 17. | 27. | 46. | * | * | * | * | * | * | * | * | * | * |
| 12. | 17. | 26. | 43. | * | * | * | * | * | * | * | * | * | * |
| 13. | 17. | 26. | 39. | * | * | * | * | * | * | * | * | * | * |
| 14. | 17. | 25. | 37. | * | * | * | * | * | * | * | * | * | * |
| 15. | 17. | 24. | 35. | * | * | * | * | * | * | * | * | * | * |
| 16. | 17. | 24. | 34. | 52. | * | * | * | * | * | * | * | * | * |
| 17. | 17. | 23. | 33. | 49. | * | * | * | * | * | * | * | * | * |
| 18. | 17. | 23. | 32. | 46. | * | * | * | * | * | * | * | * | * |
| 19. | 18. | 23. | 32. | 44. | * | * | * | * | * | * | * | * | * |
| 20. | 18. | 23. | 31. | 41. | * | * | * | * | * | * | * | * | * |
| 21. | 18. | 22. | 31. | 40. | 57. | * | * | * | * | * | * | * | * |
| 22. | 18. | 22. | 30. | 39. | 54. | * | * | * | * | * | * | * | * |
| 23. | 18. | 22. | 30. | 38. | 52. | * | * | * | * | * | * | * | * |
| 24. | 18. | 22. | 29. | 37. | 50. | * | * | * | * | * | * | * | * |
| 25. | 18. | 22. | 29. | 36. | 48. | * | * | * | * | * | * | * | * |
| 26. | 17. | 22. | 28. | 36. | 46. | 62. | * | * | * | * | * | * | * |
| 27. | 17. | 23. | 28. | 36. | 45. | 60. | * | * | * | * | * | * | * |
| 28. | 17. | 23. | 28. | 35. | 43. | 58. | * | * | * | * | * | * | * |
| 29. | 17. | 23. | 28. | 35. | 43. | 56. | * | * | * | * | * | * | * |
| 30. | 17. | 23. | 27. | 35. | 42. | 54. | * | * | * | * | * | * | * |

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at approximately 50°

Seafloor Type: Mud

Horizontal Design Load (kips)

25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

**Anchor
Weight
(Kips)**

| | | | | | | | | | | | | |
|-----|----|-----|-----|------|------|------|------|------|------|------|------|------|
| 5. | 4. | 23. | 64. | 158. | * | * | * | * | * | * | * | * |
| 6. | 3. | 15. | 45. | 96. | 236. | * | * | * | * | * | * | * |
| 7. | 2. | 10. | 34. | 68. | 127. | 322. | * | * | * | * | * | * |
| 8. | 2. | 7. | 25. | 52. | 93. | 168. | 398. | * | * | * | * | * |
| 9. | 1. | 6. | 18. | 43. | 72. | 120. | 205. | * | * | * | * | * |
| 10. | 1. | 6. | 14. | 35. | 57. | 94. | 148. | 280. | * | * | * | * |
| 11. | 1. | 5. | 11. | 27. | 50. | 76. | 118. | 183. | 352. | * | * | * |
| 12. | 0. | 4. | 9. | 21. | 43. | 63. | 96. | 140. | 216. | 418. | * | * |
| 13. | 0. | 4. | 8. | 18. | 36. | 56. | 81. | 118. | 169. | 266. | * | * |
| 14. | 0. | 3. | 7. | 15. | 29. | 50. | 68. | 99. | 138. | 200. | 333. | * |
| 15. | 0. | 3. | 7. | 13. | 24. | 43. | 61. | 85. | 118. | 158. | 229. | 395. |
| 16. | 0. | 3. | 6. | 10. | 21. | 37. | 55. | 73. | 102. | 138. | 188. | 265. |
| 17. | 0. | 2. | 6. | 10. | 18. | 32. | 50. | 66. | 90. | 120. | 156. | 216. |
| 18. | 0. | 2. | 5. | 9. | 16. | 27. | 44. | 61. | 78. | 106. | 138. | 179. |
| 19. | 0. | 2. | 5. | 8. | 14. | 24. | 39. | 56. | 71. | 94. | 122. | 156. |
| 20. | 0. | 1. | 5. | 8. | 12. | 21. | 34. | 51. | 66. | 83. | 109. | 139. |
| 21. | 0. | 1. | 4. | 7. | 11. | 19. | 30. | 46. | 61. | 75. | 98. | 124. |
| 22. | 0. | 1. | 4. | 7. | 10. | 17. | 26. | 41. | 56. | 70. | 88. | 112. |
| 23. | 0. | 1. | 4. | 7. | 10. | 15. | 24. | 36. | 52. | 66. | 79. | 102. |
| 24. | 0. | 1. | 3. | 6. | 9. | 13. | 22. | 32. | 47. | 61. | 74. | 92. |
| 25. | 0. | 1. | 3. | 6. | 9. | 12. | 20. | 28. | 43. | 57. | 70. | 83. |
| 26. | 0. | 0. | 3. | 5. | 8. | 11. | 18. | 26. | 39. | 53. | 66. | 78. |
| 27. | 0. | 0. | 2. | 8. | 8. | 11. | 16. | 24. | 35. | 49. | 62. | 74. |
| 28. | 0. | 0. | 2. | 8. | 8. | 10. | 15. | 22. | 31. | 44. | 58. | 70. |
| 29. | 0. | 0. | 2. | 7. | 7. | 10. | 13. | 21. | 28. | 41. | 54. | 66. |
| 30. | 0. | 0. | 2. | 7. | 7. | 10. | 12. | 19. | 26. | 37. | 50. | 63. |

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at approximately 30°

Seafloor Type: Sand

Horizontal Design Load (Kips)

| Anchor
Weight
(Kips) | 25. | 50. | 75. | 100. | 125. | 150. | 175. | 200. | 225. | 250. | 275. | 300. |
|----------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| 5. | 15. | 21. | 28. | 39. | 55. | * | * | * | * | * | * | * |
| 6. | 15. | 20. | 27. | 36. | 45. | 63. | * | * | * | * | * | * |
| 7. | 15. | 20. | 27. | 32. | 42. | 51. | 77. | * | * | * | * | * |
| 8. | 15. | 20. | 26. | 30. | 39. | 47. | 59. | 91. | * | * | * | * |
| 9. | 15. | 20. | 25. | 30. | 36. | 45. | 53. | 67. | 103. | * | * | * |
| 10. | 15. | 21. | 24. | 30. | 33. | 42. | 50. | 58. | 74. | 116. | * | * |
| 11. | 16. | 20. | 24. | 29. | 33. | 40. | 47. | 55. | 65. | 88. | * | * |
| 12. | 16. | 20. | 24. | 28. | 33. | 37. | 45. | 52. | 59. | 72. | 101. | * |
| 13. | 16. | 20. | 24. | 28. | 33. | 36. | 43. | 50. | 57. | 65. | 79. | 114. |
| 14. | 17. | 20. | 24. | 27. | 32. | 36. | 41. | 48. | 55. | 61. | 72. | 91. |
| 15. | 17. | 20. | 24. | 27. | 32. | 36. | 39. | 46. | 53. | 59. | 65. | 78. |
| 16. | 17. | 20. | 24. | 27. | 31. | 36. | 38. | 44. | 51. | 57. | 63. | 72. |
| 17. | 17. | 20. | 24. | 27. | 31. | 35. | 38. | 52. | 49. | 55. | 61. | 67. |
| 18. | 18. | 20. | 24. | 27. | 30. | 35. | 38. | 41. | 47. | 54. | 59. | 65. |
| 19. | 18. | 20. | 24. | 27. | 30. | 34. | 38. | 41. | 46. | 52. | 58. | 63. |
| 20. | 18. | 20. | 24. | 27. | 30. | 34. | 38. | 40. | 44. | 50. | 56. | 62. |
| 21. | 18. | 20. | 24. | 27. | 30. | 33. | 37. | 40. | 43. | 49. | 55. | 60. |
| 22. | 19. | 21. | 24. | 27. | 30. | 33. | 37. | 40. | 43. | 47. | 53. | 59. |
| 23. | 19. | 23. | 24. | 27. | 30. | 32. | 36. | 40. | 43. | 46. | 52. | 57. |
| 24. | 19. | 21. | 24. | 27. | 30. | 32. | 36. | 40. | 42. | 45. | 50. | 56. |
| 25. | 19. | 21. | 24. | 27. | 30. | 32. | 36. | 40. | 42. | 45. | 49. | 54. |
| 26. | 19. | 21. | 24. | 27. | 30. | 32. | 35. | 39. | 42. | 44. | 47. | 53. |
| 27. | 20. | 21. | 24. | 27. | 30. | 32. | 35. | 39. | 42. | 44. | 46. | 52. |
| 28. | 20. | 21. | 24. | 27. | 30. | 32. | 35. | 38. | 42. | 44. | 46. | 50. |
| 29. | 20. | 22. | 24. | 27. | 30. | 32. | 34. | 38. | 41. | 44. | 46. | 49. |
| 30. | 20. | 22. | 24. | 27. | 30. | 32. | 34. | 37. | 41. | 44. | 46. | 48. |

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-2
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 45°

Seafloor Type: Mud

Horizontal Design Load (Kips)

| | 25. | 50. | 75. | 100. | 125. | 150. | 175. | 200. | 225. | 250. | 275. | 300. |
|----------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| Anchor
Weight
(Kips) | 5. | 6. | * | * | * | * | * | * | * | * | * | * |
| 6. | 4. | 54. | * | * | * | * | * | * | * | * | * | * |
| 7. | 4. | 32. | * | * | * | * | * | * | * | * | * | * |
| 8. | 3. | 21. | * | * | * | * | * | * | * | * | * | * |
| 9. | 3. | 13. | 70. | * | * | * | * | * | * | * | * | * |
| 10. | 2. | 9. | 47. | * | * | * | * | * | * | * | * | * |
| 11. | 2. | 6. | 35. | 183. | * | * | * | * | * | * | * | * |
| 12. | 1. | 6. | 27. | 99. | * | * | * | * | * | * | * | * |
| 13. | 1. | 6. | 21. | 64. | * | * | * | * | * | * | * | * |
| 14. | 0. | 5. | 15. | 47. | 200. | * | * | * | * | * | * | * |
| 15. | 0. | 5. | 12. | 40. | 128. | * | * | * | * | * | * | * |
| 16. | 0. | 5. | 10. | 33. | 79. | * | * | * | * | * | * | * |
| 17. | 0. | 4. | 7. | 27. | 63. | * | * | * | * | * | * | * |
| 18. | 0. | 4. | 7. | 22. | 50. | 154. | * | * | * | * | * | * |
| 19. | 0. | 4. | 7. | 17. | 44. | 95. | * | * | * | * | * | * |
| 20. | 0. | 3. | 7. | 14. | 38. | 77. | * | * | * | * | * | * |
| 21. | 0. | 3. | 6. | 12. | 33. | 64. | 179. | * | * | * | * | * |
| 22. | 0. | 2. | 6. | 10. | 28. | 53. | 124. | * | * | * | * | * |
| 23. | 0. | 2. | 6. | 8. | 23. | 48. | 90. | * | * | * | * | * |
| 24. | 0. | 2. | 6. | 8. | 19. | 42. | 77. | 202. | * | * | * | * |
| 25. | 0. | 1. | 5. | 8. | 17. | 37. | 65. | 152. | * | * | * | * |
| 26. | 0. | 1. | 5. | 8. | 15. | 33. | 56. | 104. | * | * | * | * |
| 27. | 0. | 1. | 5. | 7. | 13. | 29. | 51. | 89. | 224. | * | * | * |
| 28. | 0. | 1. | 5. | 7. | 11. | 25. | 46. | 78. | 177. | * | * | * |
| 29. | 0. | 0. | 4. | 7. | 10. | 21. | 42. | 68. | 132. | * | * | * |
| 30. | 0. | 0. | 4. | 7. | 9. | 19. | 38. | 59. | 101. | 245. | * | * |

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 36°

Seafloor Type: Sand

Horizontal Design Load (Kips)

25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

**Anchor
Weight
(Kips)**

| | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5. | 13. | 20. | 32. | * | * | * | * | * | * | * | * | * |
| 6. | 13. | 19. | 27. | * | * | * | * | * | * | * | * | * |
| 7. | 13. | 18. | 25. | 37. | * | * | * | * | * | * | * | * |
| 8. | 13. | 17. | 24. | 33. | * | * | * | * | * | * | * | * |
| 9. | 13. | 17. | 23. | 29. | 42. | * | * | * | * | * | * | * |
| 10. | 13. | 17. | 22. | 28. | 38. | * | * | * | * | * | * | * |
| 11. | 13. | 17. | 21. | 27. | 34. | 46. | * | * | * | * | * | * |
| 12. | 13. | 17. | 21. | 26. | 32. | 43. | * | * | * | * | * | * |
| 13. | 13. | 17. | 20. | 26. | 31. | 39. | * | * | * | * | * | * |
| 14. | 13. | 17. | 20. | 25. | 30. | 37. | 47. | * | * | * | * | * |
| 15. | 13. | 17. | 20. | 24. | 29. | 35. | 44. | * | * | * | * | * |
| 16. | 13. | 17. | 20. | 24. | 29. | 34. | 41. | 52. | * | * | * | * |
| 17. | 13. | 17. | 20. | 23. | 28. | 33. | 39. | 49. | * | * | * | * |
| 18. | 13. | 17. | 20. | 23. | 28. | 32. | 37. | 46. | * | * | * | * |
| 19. | 13. | 18. | 20. | 23. | 27. | 32. | 36. | 44. | 53. | * | * | * |
| 20. | 13. | 18. | 20. | 23. | 27. | 31. | 35. | 41. | 50. | * | * | * |
| 21. | 13. | 18. | 20. | 22. | 26. | 31. | 35. | 40. | 48. | 57. | * | * |
| 22. | 13. | 18. | 20. | 22. | 26. | 30. | 34. | 39. | 46. | 54. | * | * |
| 23. | 13. | 18. | 20. | 22. | 26. | 30. | 34. | 38. | 44. | 52. | * | * |
| 24. | 14. | 18. | 20. | 22. | 25. | 29. | 33. | 37. | 42. | 50. | 58. | * |
| 25. | 14. | 18. | 20. | 22. | 25. | 29. | 33. | 36. | 41. | 48. | 56. | * |
| 26. | 14. | 17. | 20. | 22. | 25. | 28. | 32. | 36. | 40. | 46. | 54. | 62. |
| 27. | 14. | 17. | 20. | 23. | 25. | 28. | 32. | 36. | 40. | 45. | 52. | 60. |
| 28. | 14. | 17. | 21. | 23. | 25. | 28. | 32. | 35. | 39. | 43. | 50. | 58. |
| 29. | 14. | 17. | 21. | 23. | 25. | 28. | 31. | 35. | 38. | 43. | 49. | 56. |
| 30. | 14. | 17. | 21. | 23. | 25. | 27. | 31. | 35. | 38. | 42. | 47. | 54. |

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchors with Stabilizers and Flukes Fixed at approximately 50°

Seafloor Type: Mud

Horizontal Design Load (Kips)

25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

Anchor
Weight
(Kips)

| | | | | | | | | | | | | |
|-----|----|----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 5. | . | 4. | 10. | 23. | 41. | 64. | 99. | 158. | 324. | * | * | * |
| 6. | 0. | 3. | 6. | 15. | 29. | 45. | 66. | 96. | 140. | 236. | * | * |
| 7. | 0. | 2. | 5. | 10. | 19. | 34. | 48. | 68. | 94. | 127. | 182. | 322. |
| 8. | 0. | 2. | 5. | 7. | 14. | 25. | 39. | 52. | 70. | 93. | 122. | 168. |
| 9. | 0. | 1. | 4. | 6. | 11. | 18. | 30. | 43. | 55. | 72. | 93. | 120. |
| 10. | 0. | 1. | 3. | 6. | 8. | 14. | 22. | 35. | 46. | 57. | 74. | 94. |
| 11. | 0. | 1. | 3. | 5. | 7. | 11. | 18. | 27. | 39. | 50. | 60. | 76. |
| 12. | 0. | 0. | 2. | 4. | 7. | 9. | 15. | 21. | 32. | 43. | 53. | 63. |
| 13. | 0. | 0. | 2. | 4. | 6. | 8. | 12. | 18. | 25. | 36. | 46. | 56. |
| 14. | 0. | 0. | 1. | 3. | 5. | 7. | 10. | 15. | 21. | 29. | 40. | 50. |
| 15. | 0. | 0. | 1. | 3. | 5. | 7. | 9. | 13. | 18. | 24. | 34. | 43. |
| 16. | 0. | 0. | 1. | 3. | 4. | 6. | 8. | 10. | 16. | 21. | 28. | 37. |
| 17. | 0. | 0. | 0. | 2. | 4. | 6. | 8. | 10. | 13. | 18. | 24. | 32. |
| 18. | 0. | 0. | 0. | 2. | 4. | 5. | 7. | 9. | 11. | 16. | 21. | 27. |
| 19. | 0. | 0. | 0. | 2. | 3. | 5. | 7. | 8. | 10. | 14. | 19. | 24. |
| 20. | 0. | 0. | 0. | 1. | 3. | 5. | 6. | 8. | 10. | 12. | 17. | 21. |
| 21. | 0. | 0. | 0. | 1. | 3. | 4. | 6. | 7. | 9. | 11. | 15. | 19. |
| 22. | 0. | 0. | 0. | 1. | 2. | 4. | 5. | 7. | 9. | 10. | 13. | 17. |
| 23. | 0. | 0. | 0. | 1. | 2. | 4. | 5. | 7. | 8. | 10. | 11. | 15. |
| 24. | 0. | 0. | 0. | 1. | 2. | 3. | 5. | 6. | 8. | 9. | 11. | 13. |
| 25. | 0. | 0. | 0. | 0. | 1. | 3. | 4. | 6. | 7. | 9. | 10. | 12. |
| 26. | 0. | 0. | 0. | 0. | 1. | 3. | 4. | 5. | 7. | 8. | 10. | 11. |
| 27. | 0. | 0. | 0. | 0. | 1. | 2. | 4. | 5. | 7. | 8. | 9. | 11. |
| 28. | 0. | 0. | 0. | 0. | 1. | 2. | 4. | 5. | 6. | 8. | 9. | 10. |
| 29. | 0. | 0. | 0. | 0. | 1. | 2. | 3. | 5. | 6. | 7. | 9. | 10. |
| 30. | 0. | 0. | 0. | 0. | 1. | 2. | 3. | 4. | 6. | 7. | 8. | 10. |

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchor with Stabilizers and Flukes Fixed at approximately 30°

Seafloor Type: Sand

Horizontal Design Load (Kips)

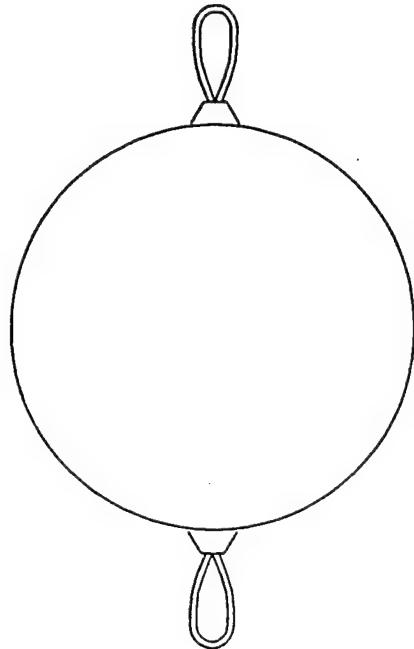
25. 50. 75. 100. 125. 150. 175. 200. 225. 250. 275. 300.

| Anchor
Weight
(Kips) | 5. | 12. | 15. | 18. | 21. | 25. | 28. | 34. | 39. | 45. | 55. | 78. | * |
|-------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 6. | 13. | 15. | 18. | 20. | 24. | 27. | 30. | 36. | 41. | 45. | 52. | 63. | |
| 7. | 13. | 15. | 18. | 20. | 23. | 27. | 29. | 32. | 37. | 42. | 46. | 51. | |
| 8. | 13. | 15. | 18. | 20. | 22. | 26. | 28. | 30. | 34. | 39. | 43. | 47. | |
| 9. | 14. | 15. | 18. | 20. | 22. | 25. | 28. | 30. | 32. | 36. | 40. | 45. | |
| 10. | 14. | 15. | 18. | 21. | 22. | 24. | 27. | 30. | 32. | 33. | 38. | 42. | |
| 11. | 15. | 16. | 18. | 20. | 22. | 24. | 26. | 29. | 32. | 33. | 35. | 40. | |
| 12. | 15. | 16. | 18. | 20. | 22. | 24. | 26. | 28. | 31. | 33. | 35. | 37. | |
| 13. | 15. | 16. | 18. | 20. | 23. | 24. | 26. | 28. | 30. | 33. | 35. | 36. | |
| 14. | 16. | 17. | 18. | 20. | 23. | 24. | 26. | 27. | 30. | 32. | 34. | 36. | |
| 15. | 16. | 17. | 18. | 20. | 22. | 24. | 26. | 27. | 29. | 32. | 34. | 36. | |
| 16. | 16. | 17. | 18. | 20. | 22. | 24. | 26. | 27. | 29. | 31. | 34. | 36. | |
| 17. | 16. | 17. | 18. | 20. | 22. | 24. | 26. | 27. | 28. | 31. | 33. | 35. | |
| 18. | 17. | 18. | 19. | 20. | 22. | 24. | 26. | 27. | 28. | 30. | 32. | 35. | |
| 19. | 17. | 18. | 19. | 20. | 22. | 24. | 26. | 27. | 28. | 30. | 32. | 34. | |
| 20. | 17. | 18. | 19. | 20. | 22. | 24. | 26. | 27. | 29. | 30. | 32. | 34. | |
| 21. | 17. | 18. | 19. | 20. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 33. | |
| 22. | 18. | 19. | 19. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 33. | |
| 23. | 18. | 19. | 20. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 24. | 18. | 19. | 20. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 25. | 18. | 19. | 20. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 26. | 19. | 19. | 20. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 27. | 19. | 20. | 20. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 28. | 19. | 20. | 21. | 21. | 22. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 29. | 19. | 20. | 21. | 22. | 23. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |
| 30. | 19. | 20. | 21. | 22. | 23. | 24. | 26. | 27. | 29. | 30. | 31. | 32. | |

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

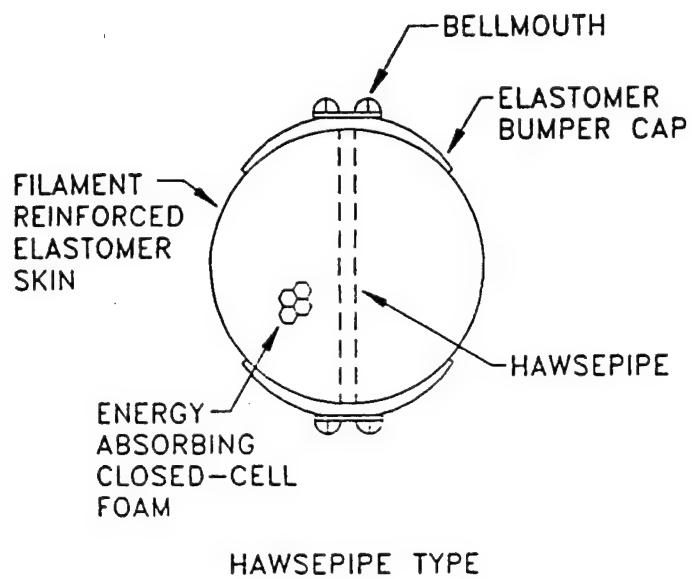
TABLE 70
Spherical Marker or Mooring Buoy¹



| | |
|-------------------------|---|
| Weight..... | 270 lbs |
| Dimensions..... | 40 inches Diameter |
| Net Buoyancy..... | 1240 lbs |
| Surface Visibility..... | 23 sq ft. |
| Hull Construction..... | 1/8" Fiberglass reinforced
polyester resin |
| Foam Filling..... | 4 lbs/ft ³ Closed cell
polyurethane |
| Color..... | International orange |

¹Data provided by Tideland Signal Corp.

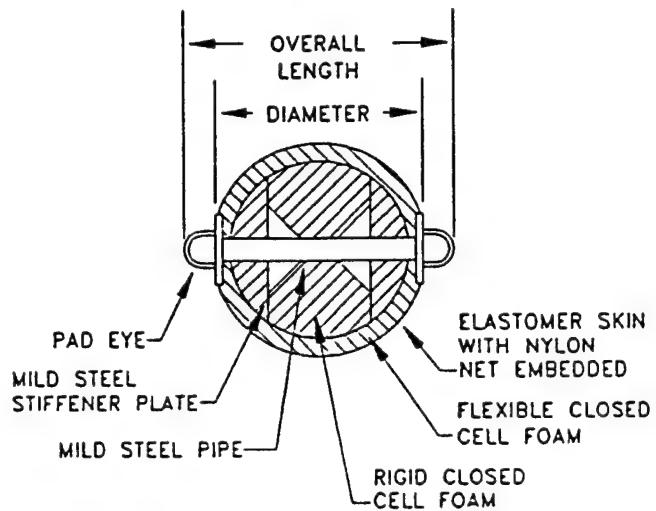
TABLE 71
Spherical Marker or Mooring Buoy¹



| DIAMETER
(FEET) | WEIGHT
IN AIR
LBS. | RESERVE
BUOYANCY
(LBS.) |
|--------------------|--------------------------|-------------------------------|
| 6.0 | 1,500 | 5,500 |
| 7.0 | 2,200 | 9,000 |
| 8.0 | 2,900 | 14,000 |
| 9.0 | 3,900 | 20,000 |
| 10.0 | 5,900 | 28,000 |

¹Data provided by Seward International Co.

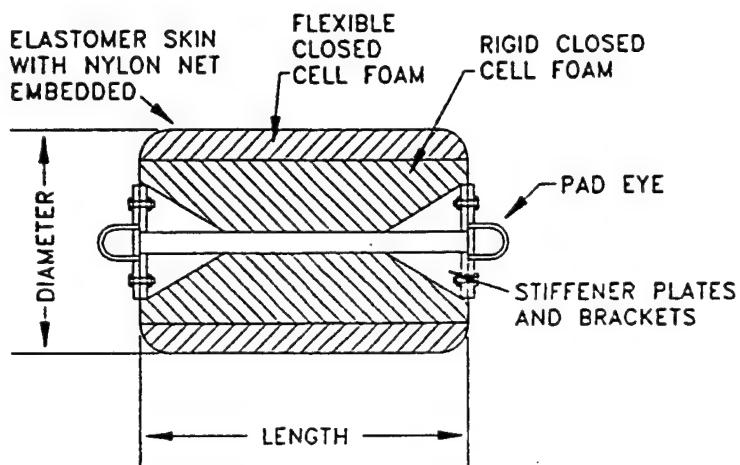
TABLE 72
Spherical Marker or Mooring Buoy¹



| DIAMETER
(FEET) | OVERALL
LENGTH
(FEET) | WEIGHT
IN AIR
(LBS.) | RESERVE
BUOYANCY
(LBS.) | MANUF
PART
NO. |
|--------------------|-----------------------------|----------------------------|-------------------------------|----------------------|
| 2.50 | 4.50 | 75 | 500 | SB5 |
| 3.25 | 5.25 | 150 | 1,000 | SB10 |
| 3.75 | 5.75 | 205 | 1,500 | SB15 |
| 4.20 | 6.20 | 290 | 2,000 | SB20 |
| 4.40 | 6.40 | 350 | 2,500 | SE25 |
| 4.75 | 6.75 | 395 | 3,000 | SE30 |
| 5.20 | 7.20 | 470 | 4,000 | SE40 |
| 5.60 | 7.60 | 605 | 5,000 | SE50 |
| 5.90 | 7.90 | 750 | 6,000 | SE60 |

¹Data provided by Samson Ocean Systems, Inc.

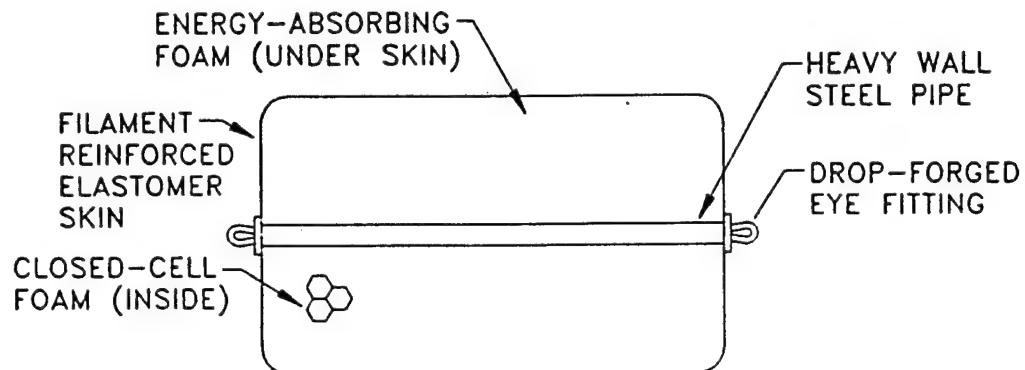
TABLE 73
Tension Bar Mooring Buoys¹



| DIAMETER
(FEET) | HEIGHT OR
LENGTH
(FEET) | WEIGHT
IN AIR
(LBS.) | RESERVE
BUOYANCY
(LBS.) | MANUF.
PART
NO. |
|--------------------|-------------------------------|----------------------------|-------------------------------|-----------------------|
| 2.00 | 4.0 | 200 | 500 | CB5 |
| 2.50 | 4.0 | 250 | 1,000 | CB10 |
| 3.00 | 4.0 | 310 | 1,500 | CB15 |
| 3.50 | 4.0 | 460 | 2,000 | CB20 |
| 4.00 | 4.5 | 600 | 3,000 | CB30 |
| 4.00 | 6.0 | 825 | 4,000 | CB40 |
| 4.50 | 6.0 | 1000 | 5,000 | CB50 |
| 5.00 | 6.0 | 1150 | 6,000 | CB60 |
| 5.50 | 6.5 | 1350 | 8,000 | CB80 |
| 5.75 | 6.5 | 1625 | 10,000 | CB100 |
| 6.00 | 8.0 | 2475 | 12,000 | CB120 |

¹Data provided by Samson Ocean Systems, Inc.

TABLE 74
Tension Bar Mooring Buoys¹



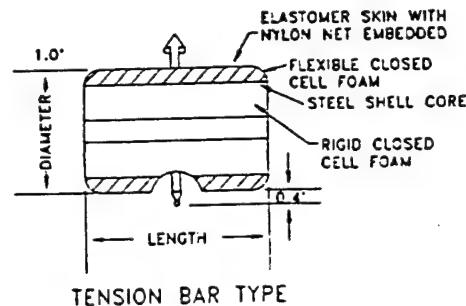
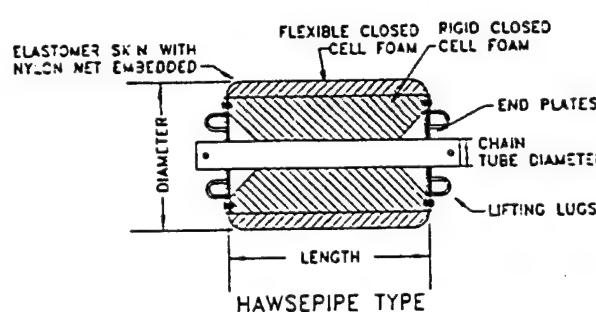
| DIAMETER
(INCHES) | HEIGHT
OR
LENGTH
(INCHES) | OVERALL
LENGTH
(INCHES) | WEIGHT
IN AIR
(LBS.) | RESERVE
BUOYANCY
(LBS.) | PICK-UP
LOAD
RATING
(LBS.) | PICK-UP
EYE
I.D.
(INCHES) |
|----------------------|------------------------------------|-------------------------------|----------------------------|-------------------------------|-------------------------------------|------------------------------------|
| 20 | 30 | 40-3/8 | 40 | 300 | 5,000 | 2-1/4 |
| 24 | 36 | 47-7/8 | 70 | 500 | 7,500 | 2-1/2 |
| 29 | 43 | 61-7/8 | 140 | 1,000 | 10,000 | 3-1/8 |
| 37 | 59 | 79-3/8 | 260 | 2,000 | 20,000 | 4 |
| 50 | 81 | 102 | 700 | 5,000 | 40,000 | 4 |

¹Data provided by Seaward International Co.

TABLE 75
Hawsepope and Tension Bar Buoys¹

TENSION BAR TYPE

| DIAMETER
(FEET) | LENGTH
(FEET) | WEIGHT
IN AIR
(LBS.) | RESERVE
BOUYANCY
(LBS.) | MANF.
PART
NO. |
|--------------------|------------------|----------------------------|-------------------------------|----------------------|
| 5.75 | 8.0 | 1,900 | 11,400 | PB11 |
| 6.50 | 9.0 | 2,700 | 16,400 | PB16 |
| 7.25 | 10.0 | 3,400 | 23,000 | PB23 |
| 8.00 | 11.0 | 3,800 | 30,000 | PB30 |
| 8.75 | 13.0 | 5,000 | 40,000 | PB40 |

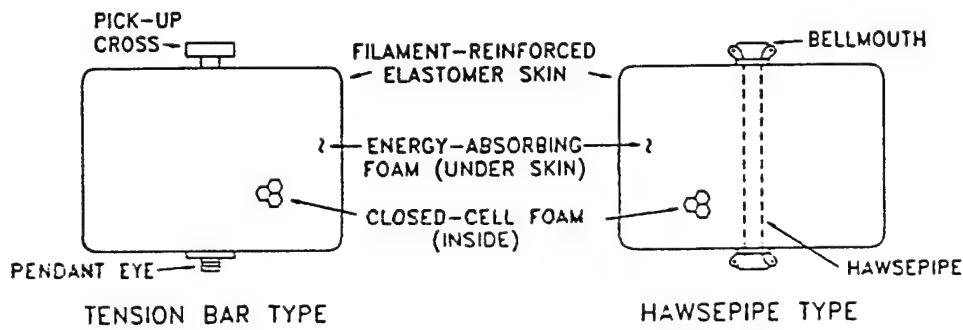


HAWSEPIPE TYPE

| DIAMETER
(FEET) | HEIGHT
OR
LENGTH
(FEET) | WEIGHT
IN AIR
(LBS.) | RESERVE
BOUYANCY
(LBS.) | HAWSEPIPE
INSIDE DIA
(INCHES) | MANF.
PART
NO. |
|--------------------|----------------------------------|----------------------------|-------------------------------|-------------------------------------|----------------------|
| 3.60 | 5.5 | 305 | 2,000 | 14 | HE10 |
| 4.25 | 5.5 | 360 | 3,000 | 14 | HE30 |
| 4.50 | 6.2 | 500 | 4,000 | 14 | HE40 |
| 4.85 | 7.5 | 1,400 | 5,000 | 16 | HE50 |
| 5.00 | 8.0 | 1,575 | 6,000 | 16 | HE60 |
| 5.00 | 8.5 | 1,700 | 8,000 | 19 | HE80 |
| 6.00 | 10.0 | 3,350 | 10,000 | 25 | HE100 |
| 6.00 | 12.0 | 3,800 | 12,000 | 30 | HE120 |

¹Data provided by Samson Ocean Systems, Inc.

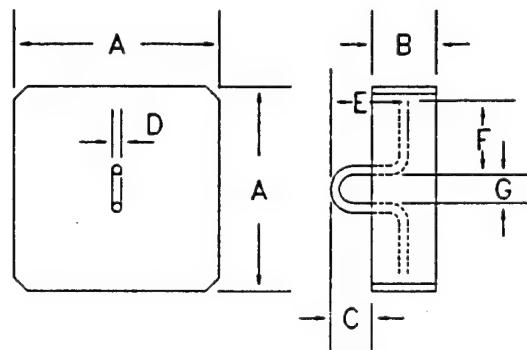
TABLE 76
Hawsepipe and Tension Bar Mooring Buoys¹



| DIAMETER
(FEET) | HEIGHT
OR
LENGTH
(FEET) | WEIGHT
IN AIR
(LBS.) | RESERVE
BOUYANCY
(LBS.) | PICK-UP LOAD
RATING (LBS.)
TENSION BAR TYPE |
|--------------------|----------------------------------|----------------------------|-------------------------------|---|
| 5.4 | 8.0 | 1,500 | 10,000 | 10,000 |
| 6.2 | 9.2 | 2,000 | 15,000 | 15,000 |
| 6.8 | 10.1 | 2,500 | 20,000 | 20,000 |
| 7.7 | 11.5 | 3,300 | 30,000 | 30,000 |
| 8.4 | 12.6 | 4,000 | 40,000 | 40,000 |
| 9.1 | 13.5 | 5,000 | 50,000 | 50,000 |

¹Data provided by Seaward International Co.

TABLE 77
Concrete Sinkers¹



| WEIGHT
(LBS.) | A | B | C | D | E | F | G |
|------------------|----|----|---|-------|----|----|-------|
| 1,000 | 35 | 10 | 4 | 3/4 | 10 | 12 | 3-1/2 |
| 2,000 | 45 | 12 | 4 | 1 | 11 | 14 | 3-1/2 |
| 5,000 | 57 | 18 | 5 | 1-5/8 | 16 | 18 | 4 |

¹Data provided by Automatic Power, Inc.

TABLE 78
Holding Power to Weight Ratios of Various Anchors¹

| ANCHOR ² | Holding Power and Type of Bottom | | |
|---------------------------------------|----------------------------------|-----------------|-----------------|
| | SAND | MUD/SILT | HARD/DENSE SOIL |
| U.S. Navy Stockless | 4.5 ³ | 3 ³ | -- |
| U.S. Navy Lightweight | 10 | 3 | -- |
| U.S. Navy State | 20 ⁴ | 15 ⁵ | 15 ⁵ |
| Danforth | 10 | 3 | -- |
| Stock Anchor Type 1
(offdrill III) | 13. ⁵ | 9 | -- |
| Moorfast | 10 | 7 | -- |
| Boss | 20 | 15 | 15 ⁵ |
| Flipper Delta | 15 | 15 | 15 |
| Stevin | 17 | 12 ⁶ | 15 |
| Stevfix | 20 | -- | 20 |
| Stevmud | -- | 19 | -- |
| Hook | -- | 18 | 10 |
| Mark-2 | 20 | -- | -- |

¹The anchor holding power ratios given are intended for use with conventional anchor weights up to 30,000 lb. only; heavier conventional anchors may possess lower holding power to weight ratios. The holding power ratios represent values established by field tests performed by the Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California and are based on efficiencies achieved during maximum permissible drag of 50 feet. Higher holding power ratios may be achieved by some anchors during longer drags. The holding power ratios do not apply where anomalous sealer conditions exist; erratic or unsatisfactory anchor performance is experienced under conditions such as layered sealers (soft sediment over stiff/dense sediment or vice versa), gravelly (plastered) sealers, thin sediment layer above rock, and unconsolidated clays with cohesion to pressure ratios less than 0.15.

²For weight ranges and dimensional characteristics of anchors and appurtenances, see Tables in Sections 4 and 6.

³The flukes should be restricted to a 35° angle opening in sand and fixed fully open in mud.

⁴Values indicated are for fabricated (welded) anchors only. They should not be applied to cast anchors.

⁵Only with fluke angle reduced to 32° and with stabilizers lengthened by 35%.

⁶In very soft bottoms this anchor should be installed without the retrieving wire rope pendant attached to the corner eye opening in one of the flukes. This pendant may cause a dissymmetric strain leading to anchor instability and overturning resulting in a major loss of holding power.

TABLE 79
Moorings Without Sinkers Bills of Materials

| Class | AAA (Proposed) | BBB (Proposed) |
|--------------------------|----------------|----------------|
| Holding Power (lbs) | 500,000 | 50,000 |
| Basic Depth (ft) | 50 | 50 |
| Assembly No. | 5381 | 5382 |
|
 | | |
| Description of Item | Req. | Size |
| Tension bar Mooring Buoy | 1 | dia. hgt. |
| | | 15'0" x 9'6" |
| | | ---1 |
| Anchors | 6 | 6 |
| Chain Set Assembly No. | 1 | 5788 |
| | | 1 |
| | | 5789 |
|
 | | |
| Class | AA | BB |
| Holding Power (lbs) | 300,000 | 250,000 |
| Basic Depth (ft) | 50 | 50 |
| Assembly No. | 5377 | 5378 |
| | | |
| Description of Item | Req. | Size |
| Hawsepope Mooring Buoy | 1 | dia. hgt. |
| | | 12'0" x 6'0" |
| | | ---1 |
| Anchors | 6 | 6 |
| Chain Set Assembly No. | 1 | 5785 |
| | | 1 |
| | | 5786 |
|
 | | |
| Description of Item | Req. | Size |
| Hawsepope Mooring Buoy | 1 | dia. hgt. |
| | | 12'0" x 6'0" |
| | | ---1 |
| Anchors | 6 | 6 |
| Chain Set Assembly No. | 1 | 5784 |
| | | 1 |
| | | 5787 |

¹For anchor selection procedure, see introduction to this part.

TABLE 80
Moorings Without Sinkers Chain Set Assembly for Basic Depth

| Description of Item | AAA (Proposed) | | | BBB (Proposed) | | |
|------------------------------------|----------------|--------------------|------------|----------------|--------------------|------------|
| | Reqd. | Spare ¹ | Chain Size | Reqd. | Spare ¹ | Chain Size |
| Riser chain (45 ft.) | 1 | - | 4-1/2 | 1 | - | 4-1/2 |
| Ground chain (90 ft.) ² | 42 | - | 3 | 36 | - | 3 |
| Ground chain (45 ft.) | 0 | - | 3 | 0 | - | 3 |
| Ground ring | 1 | - | 4-1/2 | 1 | - | 4-1/2 |
| Spider | 3 | - | - | 3 | - | - |
| End link ass. #1 | 1 | - | 4-1/2 | 1 | - | 4-1/2 |
| End link ass. #1 | 12 | - | 3 | 12 | - | 3 |
| End link ass. #2 | 3 | - | 4-1/2 | 3 | - | 4-1/2 |
| Anchor link (pear shaped) | 4 | - | 4-1/2 | 4 | 1 | 4-1/2 |
| Detachable Link | 3 | 1 | 4-1/2 | 3 | 1 | 4-1/2 |
| Joining Link | 48 | 16 | 3 | 42 | 14 | 3 |
| End shackle | 3 | 1 | 4-1/2 | 3 | 1 | 4-1/2 |
| End shackle | 6 | 1 | 3 | 6 | 1 | 3 |
| Swivel assembly | 1 | - | 4-1/2 | 1 | - | 4-1/2 |
| Swivel shackle | 6 | - | 3 | 6 | - | 3 |

| Description of Item | AA | | | BB | | | CC | | | DD | | |
|------------------------------------|-------|--------------------|------------|-------|--------------------|------------|-------|--------------------|------------|-------|--------------------|------------|
| | Reqd. | Spare ¹ | Chain Size |
| Mooring Class | | | | | | | | | | | | |
| Basic Depth (ft.) | 50 | | | 50 | | | 50 | | | 50 | | |
| Chain Set Assembly No. | 5784 | | | 5785 | | | 5786 | | | 5787 | | |
| Description of Item | Chain | | | Chain | | | Chain | | | Chain | | |
| | Reqd. | Spare ¹ | Size |
| Riser chain (45 ft.) ³ | 1 | - | 4 | 1 | - | 3-1/2 | 1 | - | 3-1/2 | 1 | - | 3 |
| Ground chain (90 ft.) ³ | 24 | - | 2-3/4 | 24 | - | 2-1/2 | 24 | - | 2-1/4 | 12 | - | 3 |
| Ground chain (45 ft.) | 6 | - | 2-3/4 | 6 | - | 2-1/2 | 6 | - | 2-1/4 | 3 | - | 3 |
| Ground ring | 1 | - | 3-1/2 | 1 | - | 3-1/2 | 1 | - | 3-1/2 | 1 | - | 3 |
| Spider | 3 | - | - | 3 | - | - | 3 | - | - | - | - | - |
| End link | 1 | - | 4 | 1 | - | 3-1/2 | 1 | - | 3-1/2 | 1 | - | 3 |
| F-shackle with legs | 1 | 1 | 4 | 1 | 1 | 3-1/2 | 1 | 1 | 3-1/2 | 1 | 1 | 3 |
| Anchor Joining Link | 8 | 1 | 4 | 8 | 1 | 3-1/2 | 8 | 1 | 3-1/2 | - | - | - |
| Anchor Joining Link | 12 | 3 | 2-3/4 | 12 | 3 | 2-1/2 | 12 | 3 | 2-1/4 | 8 | 2 | 3 |
| Chain Joining link ³ | 1 | 2 | 4 | 1 | 1 | 3-1/2 | 1 | 1 | 3-1/2 | - | - | - |
| Chain Joining link ³ | 30 | 10 | 2-3/4 | 30 | 10 | 2-1/2 | 30 | 10 | 2-1/4 | 16 | 6 | 3 |
| Chain swivel ³ | 1 | - | 4 | 1 | - | 3-1/2 | 1 | - | 3-1/2 | - | - | - |
| Chain swivel ³ | 6 | - | 2-3/4 | 6 | - | 2-1/2 | 6 | - | 2-1/4 | 4 | - | 3 |
| Pubbing casting | 1 | - | 4 | 1 | - | 3-1/2 | 1 | - | 3-1/2 | 1 | - | 3 |

¹Ship to advanced bases for each Assembly regardless of water depth.

²Length of each ground leg includes one more shot of chain than that required by catenary configuration at rated load. This extra shot serves to accommodate any temporary load increases due to dynamic forces.

³If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 81
Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths¹

| Depth of
Water (ft) | (Proposed) | | Class | | | |
|------------------------|---------------------|------------------|----------------|----------------|----------------|----------------|
| | AAA ² | BBB ² | AA | BB | CC | DD |
| Basic | 7 | 6 | 4-1/2 | 4-1/2 | 4-1/2 | 4-1/2 |
| Basic to 50 | 7 | 6 | 4-1/2 | 4-1/2 | 4-1/2 | 4-1/2 |
| 50 to 60 | 7-1/2 | 6-1/2 | 5 | 5 | 5 | 5 |
| 60 to 70 | 8 | 7 | 5 | 5-1/2 | 5-1/2 | 5 |
| 70 to 80 | 8-1/2 | 7 | 5-1/2 | 5-1/2 | 5-1/2 | 5-1/2 |
| 80 to 90 | 9 | 7-1/2 | 6 | 6 | 6 | 6 |
| 90 to 100 | 9-1/2 | 8 | 6 ³ | 6-1/2 | 6-1/2 | 6 |
| 100 to 115 | 10 | 8 | - | 6-1/2 | 6-1/2 | 6-1/2 |
| 115 to 130 | 10 | 8-1/2 | - | 7 ³ | 7 ³ | 7 |
| 130 to 145 | 10-1/2 ³ | 9 ³ | - | - | - | 7 |
| 145 to 160 | - | - | - | - | - | 7-1/2 |
| 160 to 175 | - | - | - | - | - | 8 |
| 175 to 190 | - | - | - | - | - | 8 ³ |

¹Lengths are 90 ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location.

²Includes an extra shot of chain to accommodate any temporary load increases due to dynamic forces.

³Freeboard limit of 2 ft. reached at this water depth for buoy size indicated in Table 79.

TABLE 82
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths¹

| Depth of Water (feet) | Class | | | | | | | | | | | |
|-----------------------|----------------|----|----|----|----|-----|----------------|-----|-----|-----|-----|-----|
| | AAA (Proposed) | | | | | | BBB (Proposed) | | | | | |
| Basic to 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 to 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 to 70 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 70 to 80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 80 to 90 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 to 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 100 to 115 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 115 to 130 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 130 to 145 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 145 to 160 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 160 to 175 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 175 to 190 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Depth of Water (feet) | 50 | 60 | 70 | 80 | 90 | 100 | 115 | 130 | 145 | 160 | 175 | 190 |
| Basic to 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 to 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 to 70 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 70 to 80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 80 to 90 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 to 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 100 to 115 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 115 to 130 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 130 to 145 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 145 to 160 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 160 to 175 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 175 to 190 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Depth of Water (feet) | 50 | 60 | 70 | 80 | 90 | 100 | 115 | 130 | 145 | 160 | 175 | 190 |

| Depth of Water (feet) | Class | | | | | | | | | | | |
|-----------------------|-------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| | A1 | | | | | | B2 | | | | | |
| Basic to 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 to 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 to 70 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 70 to 80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 80 to 90 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 to 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 100 to 115 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 115 to 130 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 130 to 145 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 145 to 160 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 160 to 175 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 175 to 190 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Depth of Water (feet) | 50 | 60 | 70 | 80 | 90 | 100 | 115 | 130 | 145 | 160 | 175 | 190 |

| Depth of Water (feet) | Class | | | | | | | | | | | |
|-----------------------|-------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| | B3 | | | | | | C4 | | | | | |
| Basic to 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 to 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 to 70 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 70 to 80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 80 to 90 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 to 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 100 to 115 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 115 to 130 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 130 to 145 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 145 to 160 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 160 to 175 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 175 to 190 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Depth of Water (feet) | 50 | 60 | 70 | 80 | 90 | 100 | 115 | 130 | 145 | 160 | 175 | 190 |

¹Add to Basic Depth Assembly to obtain Assembly for a particular depth.
A negative sign denotes removal of that amount from the Basic Assembly.

TABLE 83
Moorings Without Sinkers Bills of Materials

¹For anchor selection procedure, see introduction to this part.

TABLE 84
Moorings Without Sinker Chain Set Assembly for Basic Depth

| Description of Item | | A | B | C | D | E | F | G |
|------------------------------------|-------------------------|-------------------|-------------------------|-------------------|-------------------------|-------------------|-------------------------|-------------------|
| Basic Length (ft.) | | 50 | 45 | 40 | 35 | 30 | 25 | 20 |
| Chain Set Assembly No. | | 5777 | 5778 | 5779 | 5780 | 5781 | 5782 | 5783 |
| Num | Share ¹ Size | Repl ¹ |
| Riser chain (45 ft.) ² | 1 | 2-3/4 | 1 | 2-1/2 | 1 | 2-1/4 | 1 | 1-3/4 |
| Ground chain (90 ft.) ² | 12 | 2-3/4 | 12 | 2-1/2 | 12 | 2 | 9 | 1-3/4 |
| Ground chain (45 ft.) ² | 3 | 2-3/4 | 3 | 2-1/2 | 0 | 2 | 3 | 1-3/4 |
| Ground ring | 1 | 2-3/4 | 1 | 2-1/2 | 1 | 2 | 1 | 1-3/4 |
| End Link | 1 | 2-3/4 | 1 | 2-1/2 | 1 | 2 | 1 | 1-3/4 |
| F-shackle without lug | 1 | - | - | - | - | 1 | 1 | 1-3/4 |
| F-shackle with lug | 1 | 2-3/4 | 1 | 2-1/2 | 1 | 2 | - | - |
| Anchor joining link | 8 | 2-3/4 | 8 | 2-1/2 | 8 | 2 | 2 | 1-3/4 |
| Joining link ² | 16 | 6-2-3/4 | 16 | 6-2-1/2 | 13 | 4 | 13 | 6-1-1/4 |
| Swivel ² | 4 | 2-3/4 | 4 | 2-1/2 | 4 | 2 | 4 | 1-3/4 |
| Joining link | 1 | - | - | - | - | 1 | - | 1-3/4 |
| Rubber casting | 1 | 2-3/4 | - | 2-1/2 | - | - | - | 1 |

Stability is dependent bases for each assembly regardless of water depth.

If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 85
Moorings Without Sinkers Maximum Mooring Depths With Various Buoys

| Buoy | NAVFAC Dwg | NAVFAC Dwg 620,659 | NAVFAC Dwg | NAVFAC Dwg | |
|--------------|-------------------------|------------------------|-------------------------|-------------------------|-------------------------|
| Details | 620,662 | bar type | 620,605 | 620,659 | |
| Size | 3'6" spherical | Dia. Hgt.
9'6"x5'0" | Dia. Hgt.
10'6"x6'6" | Dia. Hgt.
12'0"x6'0" | Dia. Hgt.
10'6"x7'6" |
| <u>Class</u> | Depth (ft) ¹ | | | | |
| A | - | - | - | 225 | - |
| B | - | - | - | 280 | - |
| C | - | 75 | 305 | - | 425 |
| D | - | 105 | 395 | - | 545 |
| E | - | 155 | 525 | - | - |
| F | - | - | - | - | - |
| G | 140 ² | - | - | - | - |

¹Buoys have a 2-ft. freeboard at depths tabulated, except as noted.

²1-ft. freeboard.

TABLE 86
Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths¹

| Depth of
Water
(ft) | Class | | | | | | G |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|-------|
| | A | B | C | D | E | F | |
| Basic | 4-1/2 | 4-1/2 | 4 | 4 | 3-1/2 | 3-1/2 | 3 |
| Basic to 50 | 4-1/2 | 4-1/2 | 4-1/2 | 4-1/2 | 4-1/2 | 4-1/2 | 3-1/2 |
| 50 to 60 | 5 | 5 | 5 | 5 | 4-1/2 | 4-1/2 | 4 |
| 60 to 70 | 5 | 5-1/2 | 5-1/2 | 5-1/2 | 5 | 5 | 4 |
| 70 to 80 | 5-1/2 | 5-1/2 | 5-1/2 | 5-1/2 | 5-1/2 | 5-1/2 | 4-1/2 |
| 80 to 90 | 6 | 6 | 6 | 6 | 5-1/2 | 5-1/2 | 4-1/2 |
| 90 to 100 | 6-1/2 | 6-1/2 | 6-1/2 | 6-1/2 | 6 | 6 | 4-1/2 |
| 100 to 120 | 7 | 7 | 7 | 7 | 6 | 6-1/2 | 5 |
| 120 to 140 | 7-1/2 | 7-1/2 | 7-1/2 | 7-1/2 | 6-1/2 | 6-1/2 | 5 |
| 140 to 160 | 7-1/2 | 7-1/2 | 7-1/2 | 7-1/2 | 7 | 7 | - |
| 160 to 180 | 8 | 8 | 8 | 8 | 7 ² | 7 | - |
| 180 to 200 | 8-1/2 | 8-1/2 | 8-1/2 | 8-1/2 | 7-1/2 ² | 7-1/2 | - |
| 200 to 240 | 9 | 9 | 9 | 8-1/2 | 8 ² | 8 | - |
| 240 to 280 | 8-1/2 ² | 9-1/2 | 9-1/2 | 9 | 8-1/2 ² | 8-1/2 | - |
| 280 to 320 | 10 ² | 10 ² | 10 | 9-1/2 | 8-1/2 ² | 9 | - |
| 320 to 360 | 10-1/2 ² | 10-1/2 ² | 10-1/2 ² | 10 | 9 ² | 9 | - |
| 360 to 400 | 10-1/2 ² | 11 ² | 11 ² | 10-1/2 | 9-1/2 ² | 9-1/2 | - |
| 400 to 440 | 11 ² | 11 ² | - | 11 ² | 10 ² | 9-1/2 | - |
| 440 to 480 | - | 11-1/2 ² | - | 11 ² | 10 ² | - | - |
| 480 to 520 | - | - | - | 11-1/2 ² | 10-1/2 ² | - | - |
| 520 to 560 | - | - | - | - | 10-1/2 ² | - | - |

¹Lengths are 90-ft. shcts. Depth of water is taken at mean high water from a firm bottom at anchor location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

²The freeboard limit of the mooring's standard buoy (see Table 83) will be exceeded at this depth. An optional buoy (see Table 85) must be used.

TABLE 87
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths¹

¹Add :: Basic Destn Assembly to obtain Assembly for a particular destn

TABLE 88
Moorings with Sinkers - Bills of Materials

| | A | B | C | D | E |
|------------------------|--------------|-------------|-------------|-------------|-------------|
| Class | 150,000 | 125,000 | 100,000 | 75,000 | 50,000 |
| Holding Power (lbs.) | 50 | 45 | 40 | 35 | 35 |
| Basic Depth (ft.) | | | | | |
| Assembly No. | <u>50115</u> | <u>5254</u> | <u>5220</u> | <u>5231</u> | <u>5224</u> |
| | | | | | |
| Description of Item | Reqd. Size | Reqd. Size | Reqd. Size | Reqd. Size | Reqd. Size |
| Riser buoy | 1 dia. | 1 dia. | 1 dia. | 1 dia. | 1 dia. |
| | 12'0" | 12'0" | 10'6" | 10'6" | 9'6" |
| | hgt. | hgt. | hgt. | hgt. | hgt. |
| | 6'0" | 6'0" | 7'6" | 6'6" | 5'0" |
| | | | | | |
| Anchors | 3 --1 | 3 --1 | 3 --1 | 3 --1 | 3 --1 |
| | | | | | |
| Chain Set Assembly No. | 1 5766 | 1 5764 | 1 5763 | 1 5741 | 1 5758 |
| Sinkers | 3 8,200 | 3 8,200 | 3 8,200 | 3 8,200 | 3 8,200 |
| | (lbs.) | (lbs.) | (lbs.) | (lbs.) | (lbs.) |

¹For anchor selection procedure, see introduction to this part.

TABLE 89
Moorings With Sinkers - Chain Set Assembly for Basic Depth

| Class
Chain Set
Assembly No.
Basic Depth
(ft.) | A
5766 | | | B
5764 | | | C
5763 | | | D
5741 | | | E
5758 | | |
|--|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|------------------------|------------|-------------------------|--------------------|------------|-------------------------|------------------------|
| | Reqd.
1 | Spare ¹
- | Chain
Size
2-3/4 | Reqd.
1 | Spare ¹
- | Chain
Size
2-1/2 | Reqd.
1 | Spare ¹
- | Chain
Size
2-1/4 | Reqd.
1 | Spare ¹
- | Chain
Size
2 | Reqd.
1 | Spare ¹
- | Chain
Size
1-3/4 |
| Riser chain
(45 ft.) ² | - | - | 2-3/4 | 12 | - | 2-1/2 | 9 | - | 2-1/4 | 9 | - | 2 | 9 | - | 1-3/4 |
| Ground chain
(90 ft.) ² | 12 | - | 2-3/4 | 0 | - | 2-1/2 | 3 | - | 2-1/4 | 0 | - | 2 | 0 | - | 1-3/4 |
| Ground chain
(45 ft.) ² | 0 | - | 2-3/4 | 0 | - | 2-1/2 | 3 | - | 2-1/4 | 0 | - | 2 | 0 | - | 1-3/4 |
| Ground ring | 1 | - | 2-3/4 | 1 | - | 2-1/2 | 1 | - | 2-1/4 | 1 | - | 2 | 1 | - | 1-3/4 |
| End link | 1 | - | 2-3/4 | 1 | - | 2-1/2 | 1 | - | 2-1/4 | 1 | - | 2 | 1 | - | 1-3/4 |
| F-shackle
without links | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1-3/4 |
| F-shackle
with lugs | 1 | 1 | 2-3/4 | 1 | 1 | 2-1/2 | 1 | 1 | 2-1/4 | 1 | 1 | 2 | - | - | - |
| Anchor Joining
link | 8 | 2 | 2-3/4 | 11 | 2 | 2-1/2 | 11 | 2 | 2-1/4 | 11 | 2 | 2 | 11 | 2 | 1-3/4 |
| Joining link | 16 | 6 | 2-3/4 | 14 | 6 | 2-1/2 | 13 | 6 | 2-1/4 | 10 | 6 | 2 | 10 | 6 | 1-3/4 |
| Swivel | 4 | - | 2-3/4 | 4 | - | 2-1/2 | 4 | - | 2-1/4 | 4 | - | 2 | 4 | - | 1-3/4 |
| Rubbing
casting | 1 | - | 2-3/4 | 1 | - | 2-1/2 | - | - | - | - | - | - | - | - | - |
| Sinker shackle | 3 | - | 2"to3" | 3 | - | 2"to3" | 3 | - | 2"to3" | 3 | - | 2"to3" | 3 | - | 2" |

¹Ship to advanced bases for each assembly regardless of water depth.

²It still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot. 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 90
Moorings With Sinkers - Maximum Mooring Depths With Various Buoys

| Buoy Details
Size | NAVFAC Dwg. 620659 | NAVFAC Dwg. 620659 | NAVFAC Dwg. 620605 | NAVFAC Dwg. 620659 |
|----------------------|---|--|--|--|
| | bar type
Dia. Hgt.
<u>9'6" x 5'0"</u> | hawsepipe type
Dia. Hgt.
<u>10'6" x 6'6"</u> | bar type
Dia. Hgt.
<u>12'0" x 6'0"</u> | bar type
Dia. Hgt.
<u>10'6" x 7'6"</u> |
| Class | | | | |
| A | - | - | 225 | - |
| B | - | - | 280 | - |
| C | 80 | 305 | - | 425 |
| D | 105 | 395 | - | 545 |
| E | 150 | 525 | - | - |

¹Buoys have a 2-ft. freeboard at depth tabulated.

TABLE 91
Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths¹

| Depth of
Water
(ft.) | Class | | | | |
|----------------------------|--------------------|---------------------|--------|---------------------|--------------------|
| | A | B | C | D | E |
| Basic | 4 | 4 | 3-1/2 | 3 | 3 |
| Basic to 50 | 4 | 4 | 4 | 3-1/2 | 3-1/2 |
| 50 to 60 | 4-1/2 | 4-1/2 | 4-1/2 | 4 | 3-1/2 |
| 60 to 70 | 4-1/2 | 4-1/2 | 4-1/2 | 4 | 4 |
| 70 to 80 | 5 | 5 | 5 | 4-1/2 | 4 |
| 80 to 90 | 5-1/2 | 5-1/2 | 5-1/2 | 5 | 4-1/2 |
| 90 to 100 | 5-1/2 | 5-1/2 | 5-1/2 | 5 | 5 |
| 100 to 120 | 6 | 6 | 6 | 5-1/2 | 5-1/2 |
| 120 to 140 | 6-1/2 | 6-1/2 | 6-1/2 | 6 | 5-1/2 |
| 140 to 160 | 7 | 7 | 7 | 6-1/2 | 6 |
| 160 to 180 | 7-1/2 | 7-1/2 | 7-1/2 | 7 | 6-1/2 ² |
| 180 to 200 | 7-1/2 | 7-1/2 | 7-1/2 | 7 | 6-1/2 ² |
| 200 to 240 | 8 | 8 | 8 | 7-1/2 | 7 ² |
| 240 to 280 | 9 ² | 9 | 8-1/2 | 8 | 7 ² |
| 280 to 320 | 9-1/2 ² | 9-1/2 ² | 9 | 8-1/2 | 7-1/2 ² |
| 320 to 360 | 10 ² | 10 ² | 9-1/2 | 9 | 8 ² |
| 360 to 400 | - | 10-1/2 ² | 10 | 9-1/2 | 8 ² |
| 400 to 440 | - | 11 ² | 10-1/2 | 10 ² | 8-1/2 ² |
| 440 to 480 | - | - | - | 10-1/2 ² | 9 ² |

¹Lengths are 90-ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

²The freeboard limit of the mooring's standard buoy will be exceeded at this depth. An optional buoy must be used.

TABLE 92
Moorings With Sinkers - Chain Set Assemblies for Various Depths¹

| Depth
of
Water
(feet) | Class | | | | |
|--------------------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|
| | A | B | C | D | M |
| Basic to | 2-3/4" chain (90' shot) | 2-3/4" chain (90' shot) | 2-1/2" chain (90' shot) | 2" chain (90' shot) | 1-3/4" chain (90' shot) |
| 50 | 0 | 0 | 1 | 2 | 4 |
| 60 | 4 | 4 | 4 | 7 | 7 |
| 70 | 4 | 4 | 4 | 7 | 7 |
| 80 | 7 | 7 | 7 | 7 | 7 |
| 90 | 7 | 7 | 7 | 7 | 7 |
| 100 | 7 | 7 | 7 | 7 | 7 |
| 120 | 7 | 7 | 7 | 7 | 7 |
| 140 | 10 | 10 | 11 | 10 | 10 |
| 160 | 10 | 10 | 11 | 10 | 10 |
| 180 | 11 | 11 | 14 | 10 | 10 |
| 200 | 14 | 14 | 15 | 14 | 14 |
| 220 | 18 | 18 | 18 | 18 | 18 |
| 240 | 21 | 21 | 22 | 21 | 21 |
| 260 | - | - | 25 | 25 | 25 |
| 280 | 11 | 11 | 14 | 14 | 14 |
| 300 | 14 | 14 | 15 | 15 | 15 |
| 320 | 18 | 18 | 18 | 18 | 18 |
| 340 | 21 | 21 | 22 | 21 | 21 |
| 360 | - | - | 25 | 25 | 25 |
| 380 | 11 | 11 | 14 | 14 | 14 |
| 400 | 14 | 14 | 15 | 15 | 15 |
| 420 | 18 | 18 | 18 | 18 | 18 |
| 440 | 21 | 21 | 22 | 21 | 21 |
| 460 | - | - | 25 | 25 | 25 |
| 480 | 11 | 11 | 14 | 14 | 14 |
| 500 | 14 | 14 | 15 | 15 | 15 |
| 520 | 18 | 18 | 18 | 18 | 18 |
| 540 | 21 | 21 | 22 | 21 | 21 |
| 560 | - | - | 25 | 25 | 25 |
| 580 | 11 | 11 | 14 | 14 | 14 |
| 600 | 14 | 14 | 15 | 15 | 15 |
| 620 | 18 | 18 | 18 | 18 | 18 |
| 640 | 21 | 21 | 22 | 21 | 21 |
| 660 | - | - | 25 | 25 | 25 |
| 680 | 11 | 11 | 14 | 14 | 14 |
| 700 | 14 | 14 | 15 | 15 | 15 |
| 720 | 18 | 18 | 18 | 18 | 18 |
| 740 | 21 | 21 | 22 | 21 | 21 |
| 760 | - | - | 25 | 25 | 25 |
| 780 | 11 | 11 | 14 | 14 | 14 |
| 800 | 14 | 14 | 15 | 15 | 15 |
| 820 | 18 | 18 | 18 | 18 | 18 |
| 840 | 21 | 21 | 22 | 21 | 21 |
| 860 | - | - | 25 | 25 | 25 |
| 880 | 11 | 11 | 14 | 14 | 14 |
| 900 | 14 | 14 | 15 | 15 | 15 |
| 920 | 18 | 18 | 18 | 18 | 18 |
| 940 | 21 | 21 | 22 | 21 | 21 |
| 960 | - | - | 25 | 25 | 25 |
| 980 | 11 | 11 | 14 | 14 | 14 |
| 1000 | 14 | 14 | 15 | 15 | 15 |
| 1020 | 18 | 18 | 18 | 18 | 18 |
| 1040 | 21 | 21 | 22 | 21 | 21 |
| 1060 | - | - | 25 | 25 | 25 |
| 1080 | 11 | 11 | 14 | 14 | 14 |
| 1100 | 14 | 14 | 15 | 15 | 15 |
| 1120 | 18 | 18 | 18 | 18 | 18 |
| 1140 | 21 | 21 | 22 | 21 | 21 |
| 1160 | - | - | 25 | 25 | 25 |
| 1180 | 11 | 11 | 14 | 14 | 14 |
| 1200 | 14 | 14 | 15 | 15 | 15 |
| 1220 | 18 | 18 | 18 | 18 | 18 |
| 1240 | 21 | 21 | 22 | 21 | 21 |
| 1260 | - | - | 25 | 25 | 25 |
| 1280 | 11 | 11 | 14 | 14 | 14 |
| 1300 | 14 | 14 | 15 | 15 | 15 |
| 1320 | 18 | 18 | 18 | 18 | 18 |
| 1340 | 21 | 21 | 22 | 21 | 21 |
| 1360 | - | - | 25 | 25 | 25 |
| 1380 | 11 | 11 | 14 | 14 | 14 |
| 1400 | 14 | 14 | 15 | 15 | 15 |
| 1420 | 18 | 18 | 18 | 18 | 18 |
| 1440 | 21 | 21 | 22 | 21 | 21 |
| 1460 | - | - | 25 | 25 | 25 |
| 1480 | 11 | 11 | 14 | 14 | 14 |
| 1500 | 14 | 14 | 15 | 15 | 15 |
| 1520 | 18 | 18 | 18 | 18 | 18 |
| 1540 | 21 | 21 | 22 | 21 | 21 |
| 1560 | - | - | 25 | 25 | 25 |
| 1580 | 11 | 11 | 14 | 14 | 14 |
| 1600 | 14 | 14 | 15 | 15 | 15 |
| 1620 | 18 | 18 | 18 | 18 | 18 |
| 1640 | 21 | 21 | 22 | 21 | 21 |
| 1660 | - | - | 25 | 25 | 25 |
| 1680 | 11 | 11 | 14 | 14 | 14 |
| 1700 | 14 | 14 | 15 | 15 | 15 |
| 1720 | 18 | 18 | 18 | 18 | 18 |
| 1740 | 21 | 21 | 22 | 21 | 21 |
| 1760 | - | - | 25 | 25 | 25 |
| 1780 | 11 | 11 | 14 | 14 | 14 |
| 1800 | 14 | 14 | 15 | 15 | 15 |
| 1820 | 18 | 18 | 18 | 18 | 18 |
| 1840 | 21 | 21 | 22 | 21 | 21 |
| 1860 | - | - | 25 | 25 | 25 |
| 1880 | 11 | 11 | 14 | 14 | 14 |
| 1900 | 14 | 14 | 15 | 15 | 15 |
| 1920 | 18 | 18 | 18 | 18 | 18 |
| 1940 | 21 | 21 | 22 | 21 | 21 |
| 1960 | - | - | 25 | 25 | 25 |
| 1980 | 11 | 11 | 14 | 14 | 14 |
| 2000 | 14 | 14 | 15 | 15 | 15 |
| 2020 | 18 | 18 | 18 | 18 | 18 |
| 2040 | 21 | 21 | 22 | 21 | 21 |
| 2060 | - | - | 25 | 25 | 25 |
| 2080 | 11 | 11 | 14 | 14 | 14 |
| 2100 | 14 | 14 | 15 | 15 | 15 |
| 2120 | 18 | 18 | 18 | 18 | 18 |
| 2140 | 21 | 21 | 22 | 21 | 21 |
| 2160 | - | - | 25 | 25 | 25 |
| 2180 | 11 | 11 | 14 | 14 | 14 |
| 2200 | 14 | 14 | 15 | 15 | 15 |
| 2220 | 18 | 18 | 18 | 18 | 18 |
| 2240 | 21 | 21 | 22 | 21 | 21 |
| 2260 | - | - | 25 | 25 | 25 |
| 2280 | 11 | 11 | 14 | 14 | 14 |
| 2300 | 14 | 14 | 15 | 15 | 15 |
| 2320 | 18 | 18 | 18 | 18 | 18 |
| 2340 | 21 | 21 | 22 | 21 | 21 |
| 2360 | - | - | 25 | 25 | 25 |
| 2380 | 11 | 11 | 14 | 14 | 14 |
| 2400 | 14 | 14 | 15 | 15 | 15 |
| 2420 | 18 | 18 | 18 | 18 | 18 |
| 2440 | 21 | 21 | 22 | 21 | 21 |
| 2460 | - | - | 25 | 25 | 25 |
| 2480 | 11 | 11 | 14 | 14 | 14 |
| 2500 | 14 | 14 | 15 | 15 | 15 |
| 2520 | 18 | 18 | 18 | 18 | 18 |
| 2540 | 21 | 21 | 22 | 21 | 21 |
| 2560 | - | - | 25 | 25 | 25 |
| 2580 | 11 | 11 | 14 | 14 | 14 |
| 2600 | 14 | 14 | 15 | 15 | 15 |
| 2620 | 18 | 18 | 18 | 18 | 18 |
| 2640 | 21 | 21 | 22 | 21 | 21 |
| 2660 | - | - | 25 | 25 | 25 |
| 2680 | 11 | 11 | 14 | 14 | 14 |
| 2700 | 14 | 14 | 15 | 15 | 15 |
| 2720 | 18 | 18 | 18 | 18 | 18 |
| 2740 | 21 | 21 | 22 | 21 | 21 |
| 2760 | - | - | 25 | 25 | 25 |
| 2780 | 11 | 11 | 14 | 14 | 14 |
| 2800 | 14 | 14 | 15 | 15 | 15 |
| 2820 | 18 | 18 | 18 | 18 | 18 |
| 2840 | 21 | 21 | 22 | 21 | 21 |
| 2860 | - | - | 25 | 25 | 25 |
| 2880 | 11 | 11 | 14 | 14 | 14 |
| 2900 | 14 | 14 | 15 | 15 | 15 |
| 2920 | 18 | 18 | 18 | 18 | 18 |
| 2940 | 21 | 21 | 22 | 21 | 21 |
| 2960 | - | - | 25 | 25 | 25 |
| 2980 | 11 | 11 | 14 | 14 | 14 |
| 3000 | 14 | 14 | 15 | 15 | 15 |
| 3020 | 18 | 18 | 18 | 18 | 18 |
| 3040 | 21 | 21 | 22 | 21 | 21 |
| 3060 | - | - | 25 | 25 | 25 |
| 3080 | 11 | 11 | 14 | 14 | 14 |
| 3100 | 14 | 14 | 15 | 15 | 15 |
| 3120 | 18 | 18 | 18 | 18 | 18 |
| 3140 | 21 | 21 | 22 | 21 | 21 |
| 3160 | - | - | 25 | 25 | 25 |
| 3180 | 11 | 11 | 14 | 14 | 14 |
| 3200 | 14 | 14 | 15 | 15 | 15 |
| 3220 | 18 | 18 | 18 | 18 | 18 |
| 3240 | 21 | 21 | 22 | 21 | 21 |
| 3260 | - | - | 25 | 25 | 25 |
| 3280 | 11 | 11 | 14 | 14 | 14 |
| 3300 | 14 | 14 | 15 | 15 | 15 |
| 3320 | 18 | 18 | 18 | 18 | 18 |
| 3340 | 21 | 21 | 22 | 21 | 21 |
| 3360 | - | - | 25 | 25 | 25 |
| 3380 | 11 | 11 | 14 | 14 | 14 |
| 3400 | 14 | 14 | 15 | 15 | 15 |
| 3420 | 18 | 18 | 18 | 18 | 18 |
| 3440 | 21 | 21 | 22 | 21 | 21 |
| 3460 | - | - | 25 | 25 | 25 |
| 3480 | 11 | 11 | 14 | 14 | 14 |
| 3500 | 14 | 14 | 15 | 15 | 15 |
| 3520 | 18 | 18 | 18 | 18 | 18 |
| 3540 | 21 | 21 | 22 | 21 | 21 |
| 3560 | - | - | 25 | 25 | 25 |
| 3580 | 11 | 11 | 14 | 14 | 14 |
| 3600 | 14 | 14 | 15 | 15 | 15 |
| 3620 | 18 | 18 | 18 | 18 | 18 |
| 3640 | 21 | 21 | 22 | 21 | 21 |
| 3660 | - | - | 25 | 25 | 25 |
| 3680 | 11 | 11 | 14 | 14 | 14 |
| 3700 | 14 | 14 | 15 | 15 | 15 |
| 3720 | 18 | 18 | 18 | 18 | 18 |
| 3740 | 21 | 21 | 22 | 21 | 21 |
| 3760 | - | - | 25 | 25 | 25 |
| 3780 | 11 | 11 | 14 | 14 | 14 |
| 3800 | 14 | 14 | 15 | 15 | 15 |
| 3820 | 18 | 18 | 18 | 18 | 18 |
| 3840 | 21 | 21 | 22 | 21 | 21 |
| 3860 | - | - | 25 | 25 | 25 |
| 3880 | 11 | 11 | 14 | 14 | 14 |
| 3900 | 14 | 14 | 15 | 15 | 15 |
| 3920 | 18 | 18 | 18 | 18 | 18 |
| 3940 | 21 | 21 | 22 | 21 | 21 |
| 3960 | - | - | 25 | 25 | 25 |
| 3980 | 11 | 11 | 14 | 14 | 14 |
| 4000 | 14 | 14 | 15 | 15 | 15 |
| 4020 | 18 | 18 | 18 | 18 | 18 |
| 4040 | 21 | 21 | 22 | 21 | 21 |
| 4060 | - | - | 25 | 25 | 25 |
| 4080 | 11 | 11 | 14 | 14 | 14 |
| 4100 | 14 | 14 | 15 | 15 | 15 |
| 4120 | 18 | 18 | 18 | 18 | 18 |
| 4140 | 21 | 21 | 22 | 21 | 21 |
| 4160 | - | - | 25 | 25 | 25 |
| 4180 | 11 | 11 | 14 | 14 | 14 |
| 4200 | 14 | 14 | 15 | 15 | 15 |
| 4220 | 18 | 18 | 18 | 18 | 18 |
| 4240 | 21 | 21 | 22 | 21 | 21 |
| 4260 | - | - | 25 | 25 | 25 |
| 4280 | 11 | 11 | 14 | 14 | 14 |
| 4300 | 14 | 14 | 15 | 15 | 15 |
| 4320 | 18 | 18 | 18 | 18 | 18 |
| 4340 | 21 | 21 | 22 | 21 | 21 |
| 4360 | - | - | 25 | 25 | 25 |
| 4380 | 11 | 11 | 14 | 14 | 14 |
| 4400 | 14 | 14 | 15 | 15 | 15 |
| 4420 | 18 | 18 | 18 | 18 | 18 |
| 4440 | 21 | 21 | 22 | 21 | 21 |
| 4460 | - | - | 25 | 25 | 25 |
| 4480 | 11 | 11 | 14 | 14 | 14 |
| 4500 | 14 | 14 | 15 | 15 | 15 |
| 4520 | 18 | 18 | 18 | 18 | 18 |
| 4540 | 21 | 21 | 22 | 21 | 21 |
| 4560 | - | - | 25 | 25 | 25 |
| 4580 | 11 | 11 | 14 | 14 | 14 |
| 4600 | 14 | 14 | 15 | 15 | 15 |
| 4620 | 18 | | | | |

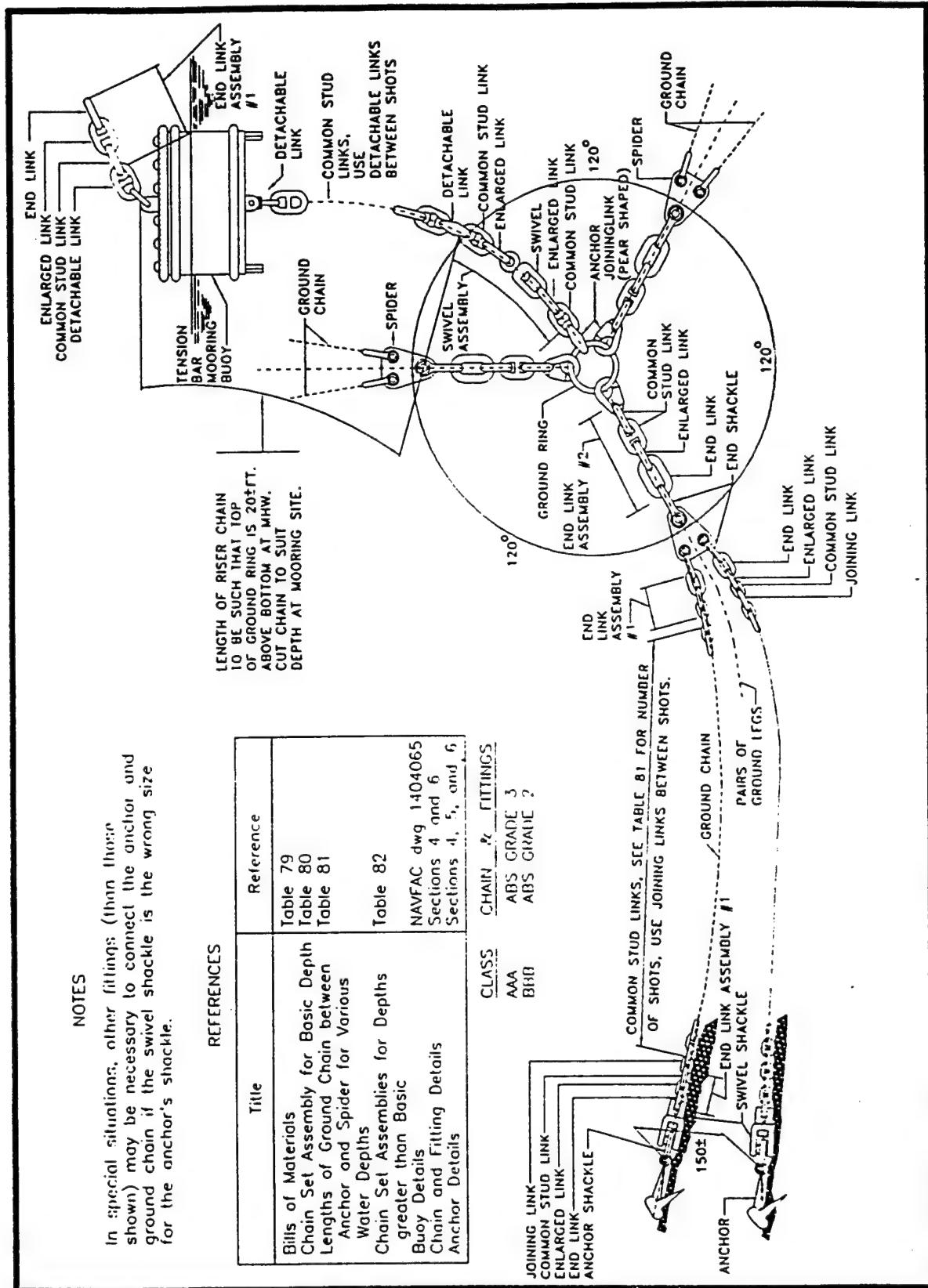


FIGURE 1
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

NOTES

In special situations, other fittings (than those shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle.

REFERENCES

| Title | Reference |
|--|--------------------------------------|
| Bills of Materials | Table 79 |
| Chain Set Assembly for Basic Depth | Table 80 |
| Lengths of Ground Chain between Anchor and Spider for Various Water Depths | Table 81 |
| Chain Set Assemblies for Depths greater than Basic Buoy Details | Table 82 |
| Chain and Fitting Details | NAVFAC dwg 620, F05 Sections 4 and 6 |
| Anchor Details | Sections 4, 5, and 6 |

ALL CHAIN IS U.S. NAVY COMMON A-LINK

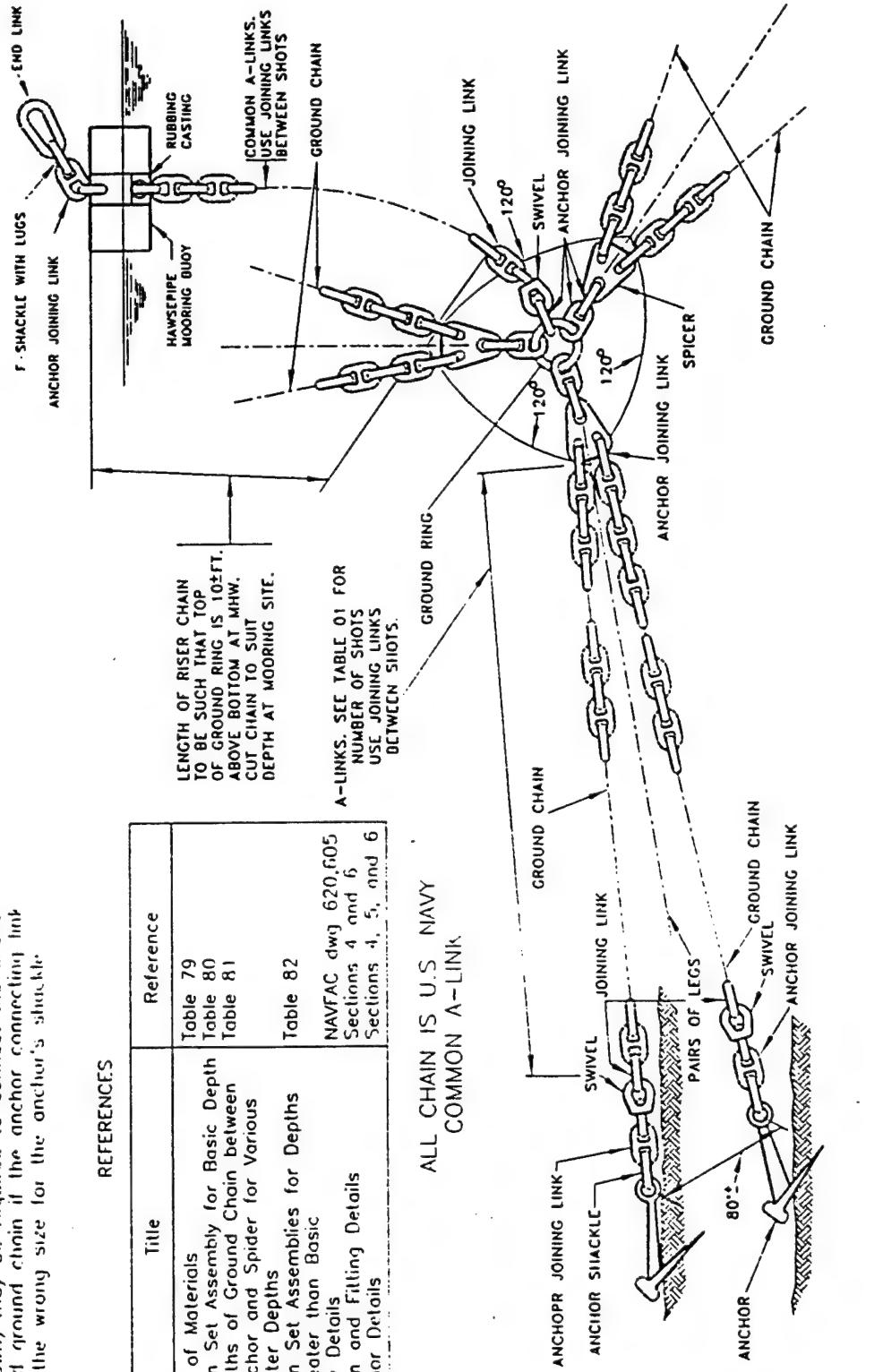


FIGURE 2
Free-Swinging, Riser-Type Mooring Without Sinkers — Classes AA, BB, and CC

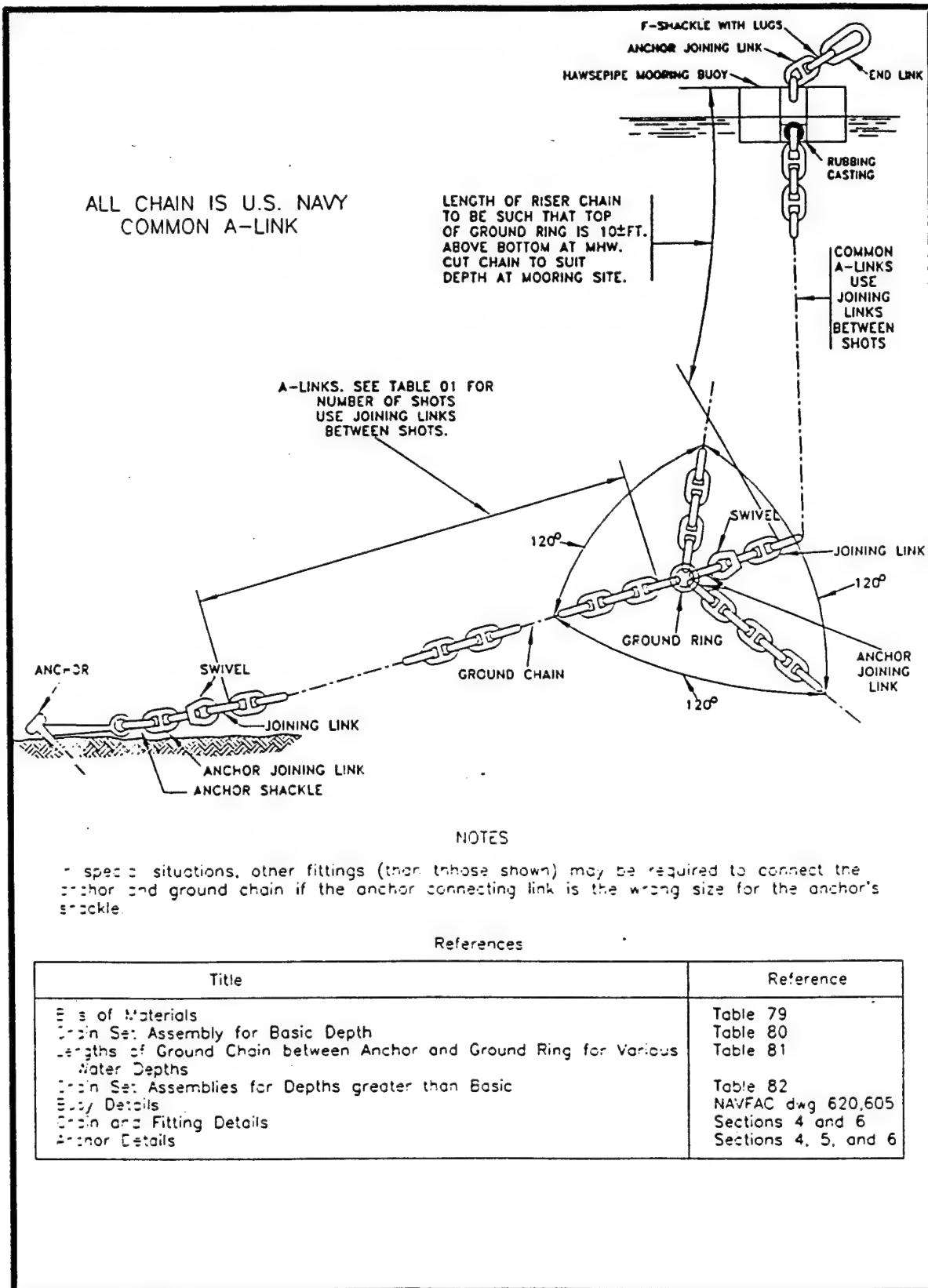


FIGURE 3
Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD

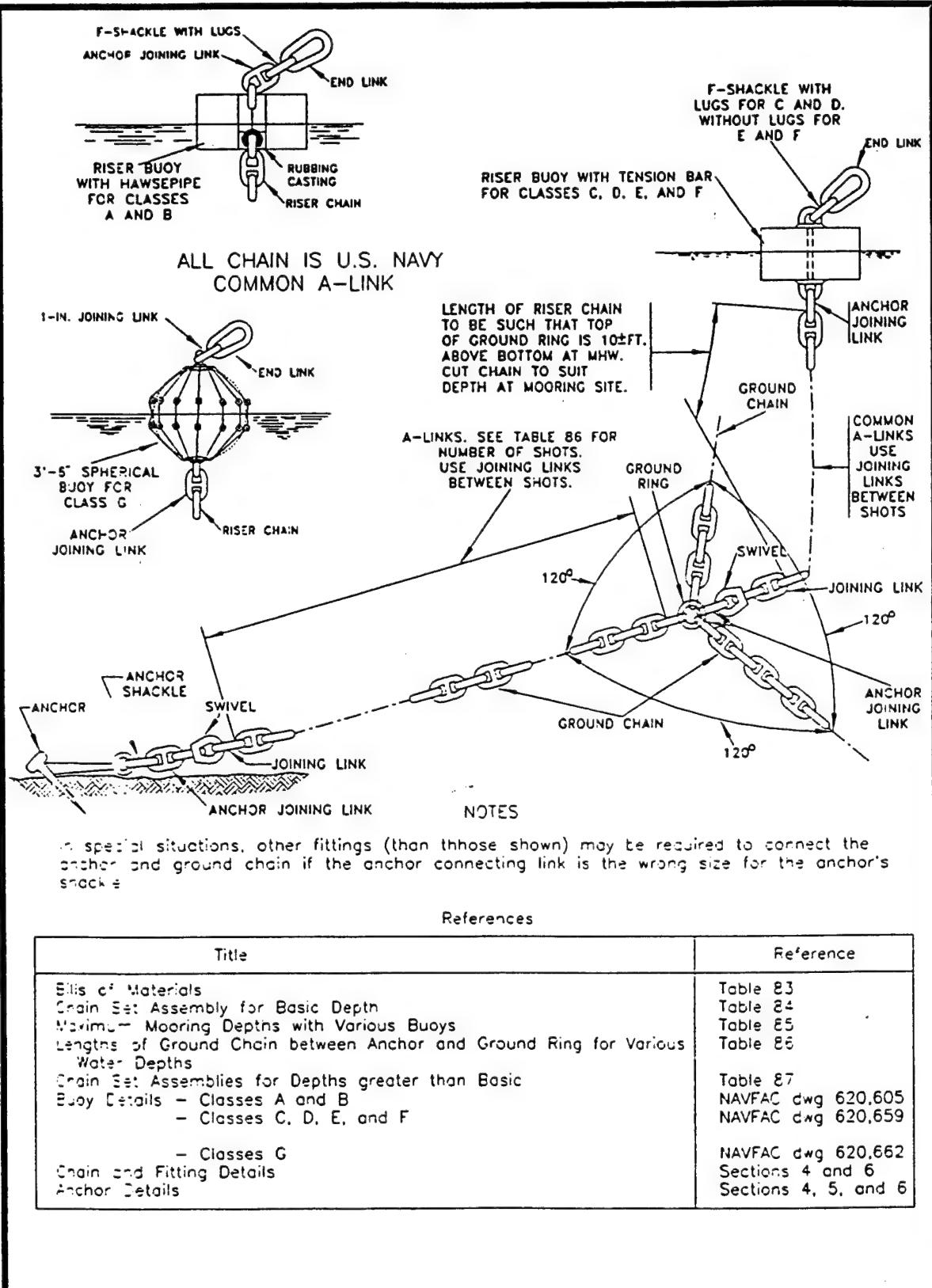


FIGURE 4
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes A, B, C, D, E, F, and G

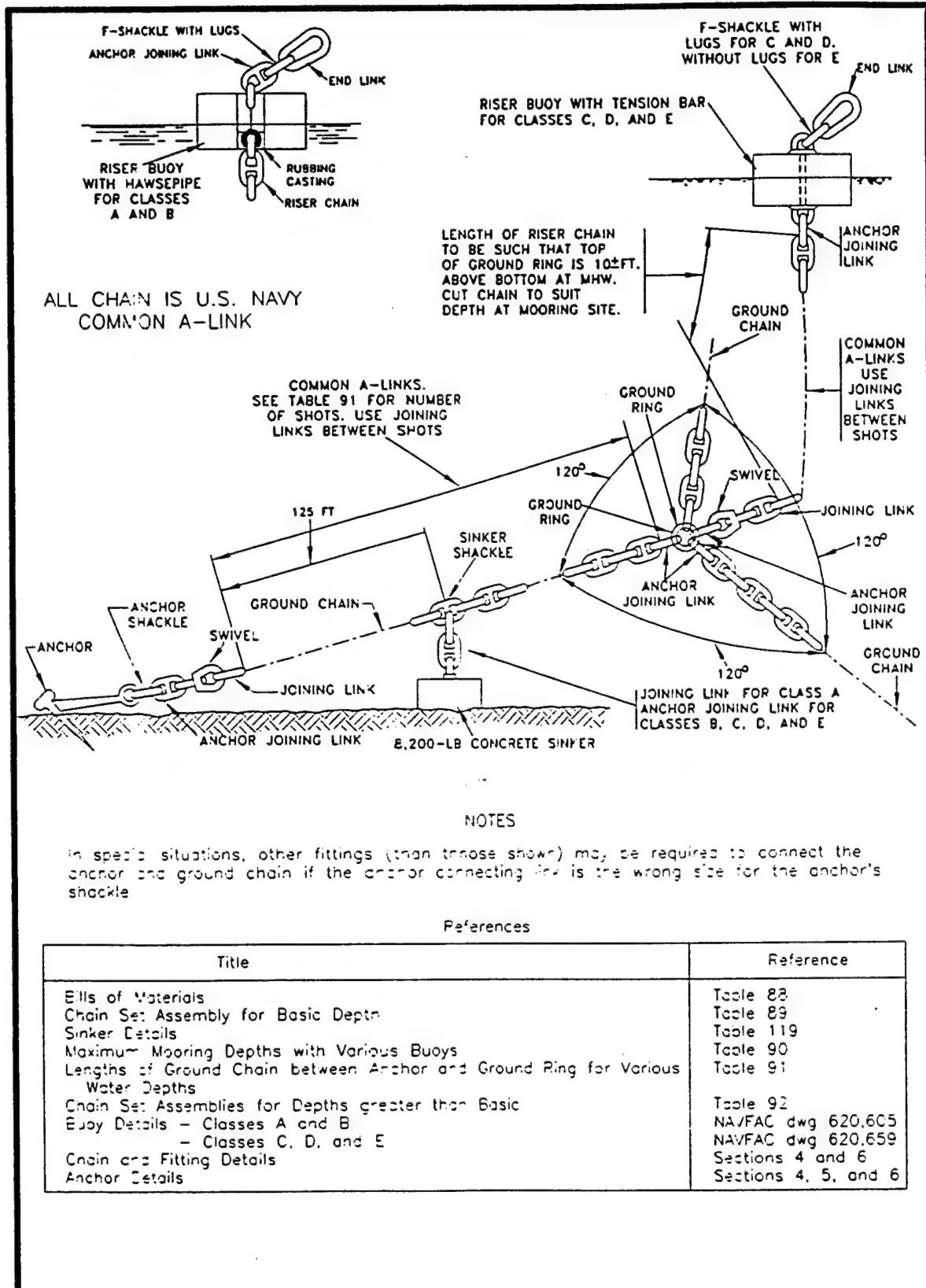


FIGURE 5
Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E

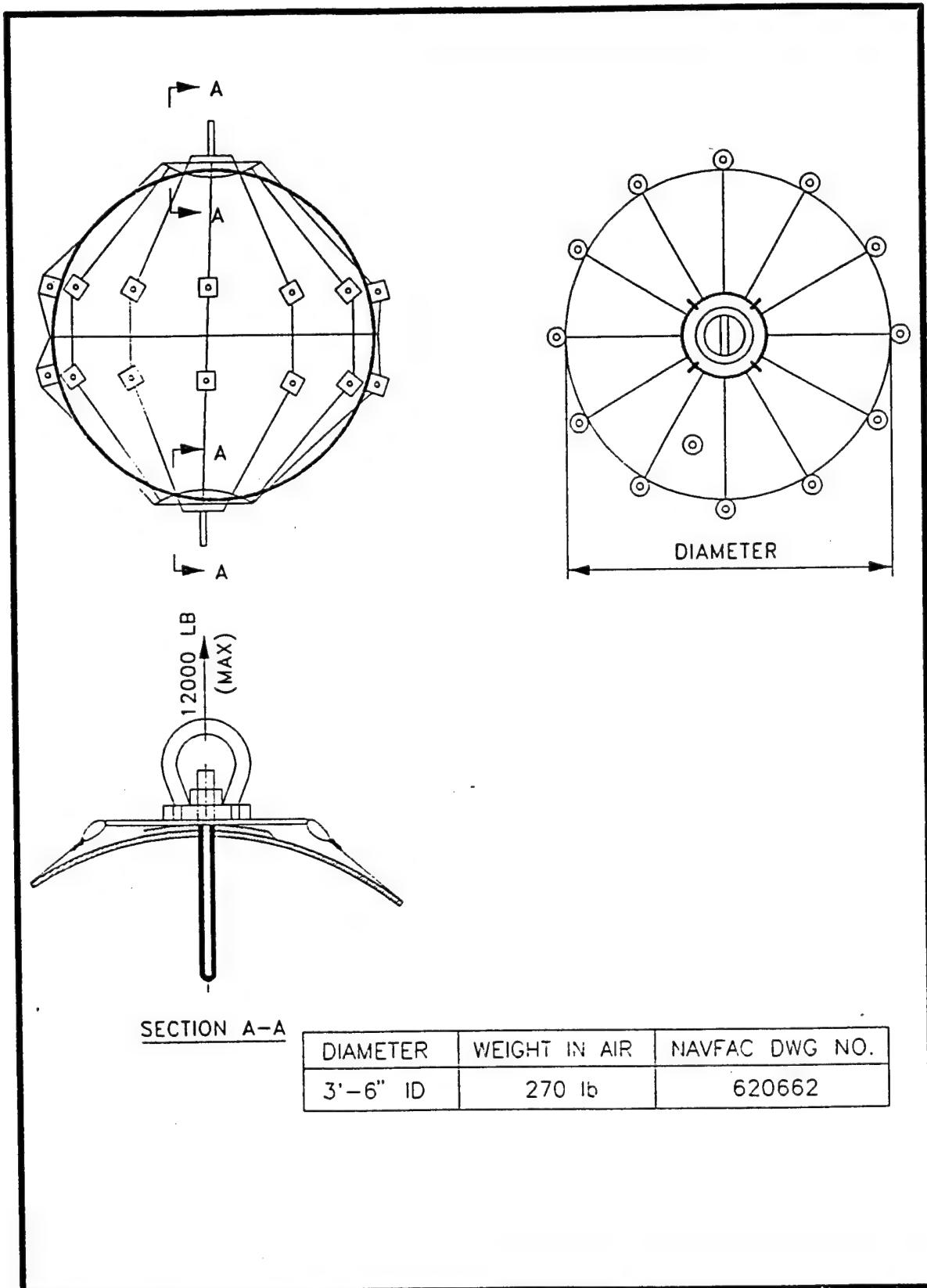


FIGURE 9
Standard Marker or Mooring Buoy

| DIAMETER | HEIGHT | WEIGHT IN AIR | NAVFAC DWG NO. |
|-------------|--------|---------------|----------------|
| 6'-6" O.D. | 5'-0" | 7,700 lbs | 620,659 |
| 10'-6" O.D. | 6'-6" | 9,600 lbs | 620,659 |
| 12'-6" O.D. | 7'-6" | 10,100 lbs | 620,659 |

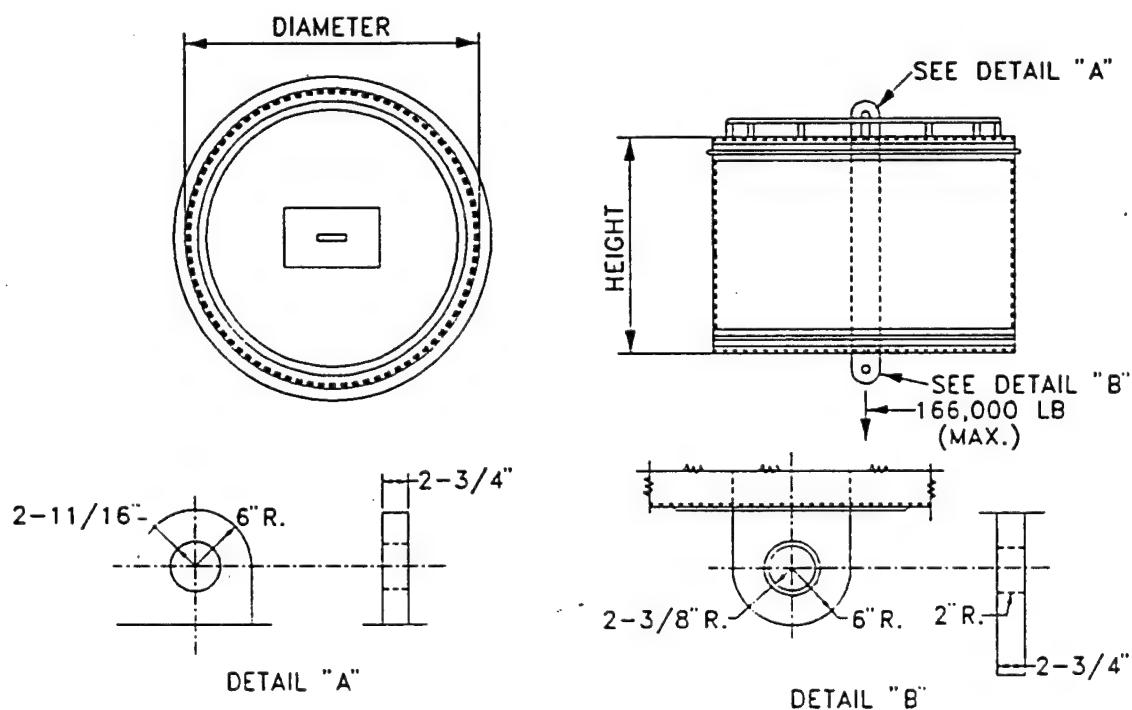


FIGURE 10
Tension Bar Mooring Buoy

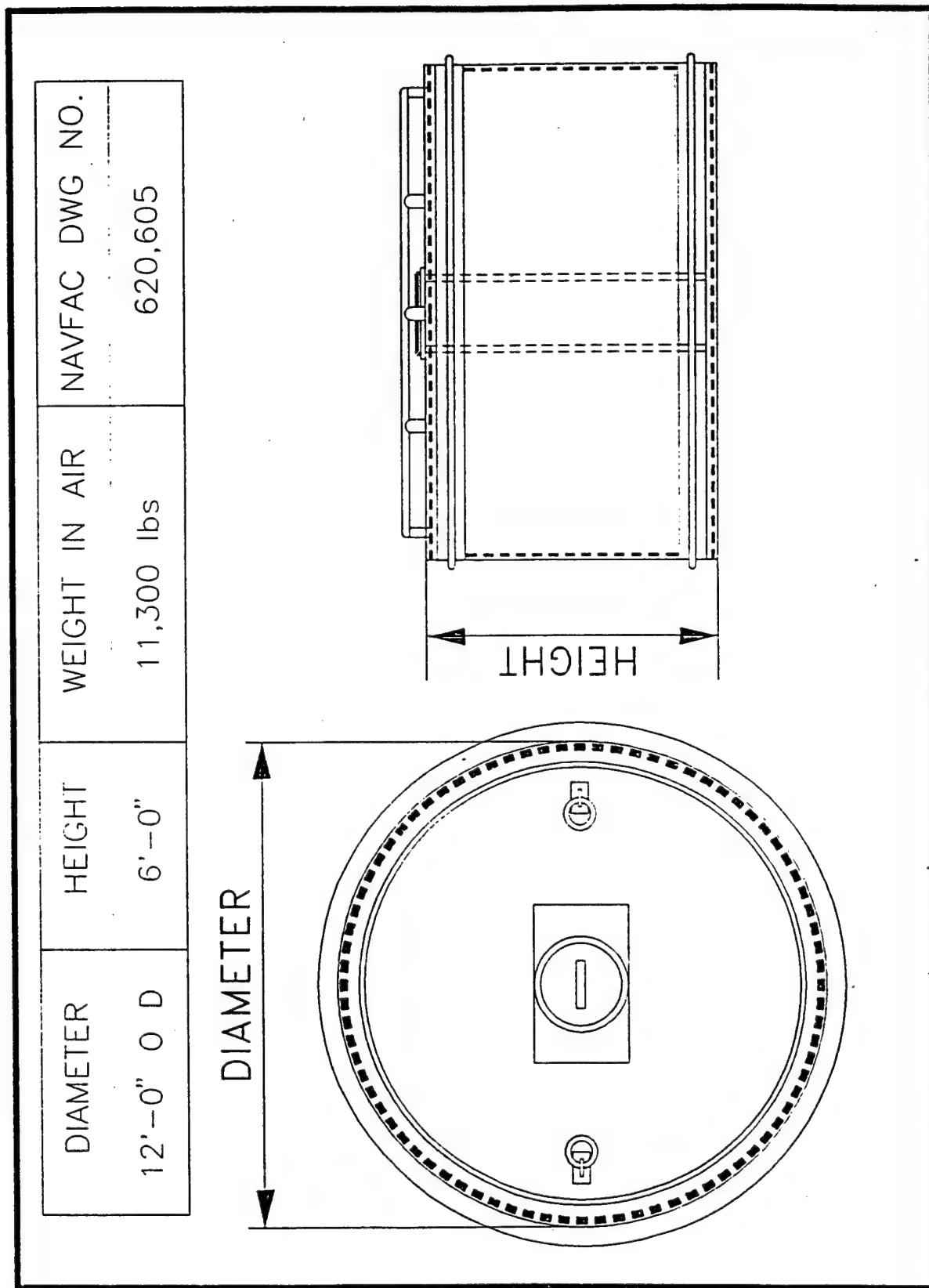


FIGURE 11
Hawsepope Mooring Buoy

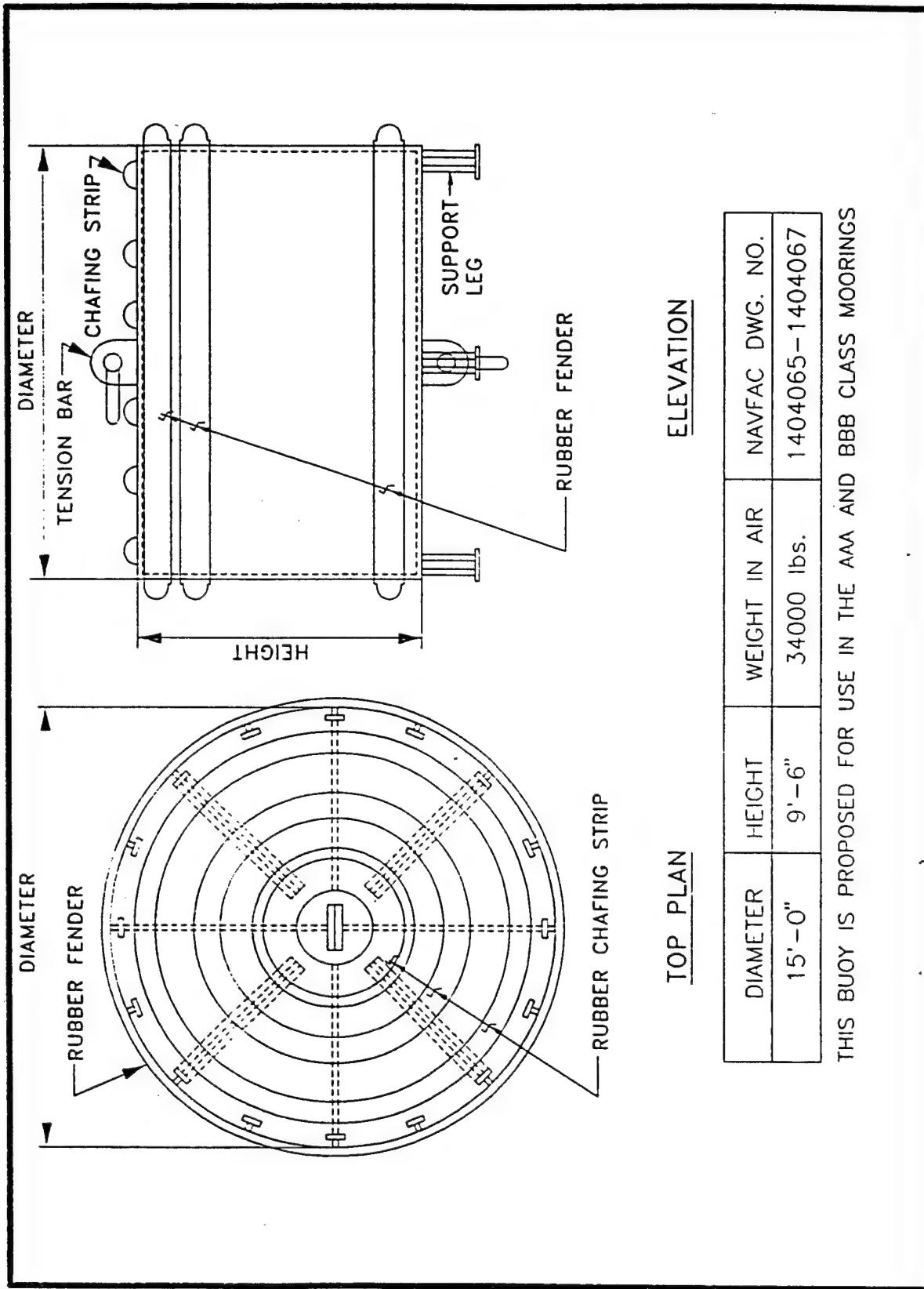
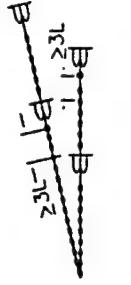
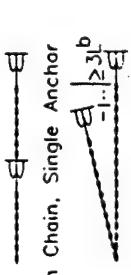


FIGURE 12
Tension Bar Mooring Buoy

TABLE 2
Recommended NAVMOOR Anchor Size^a for Navy Fleet Moorings

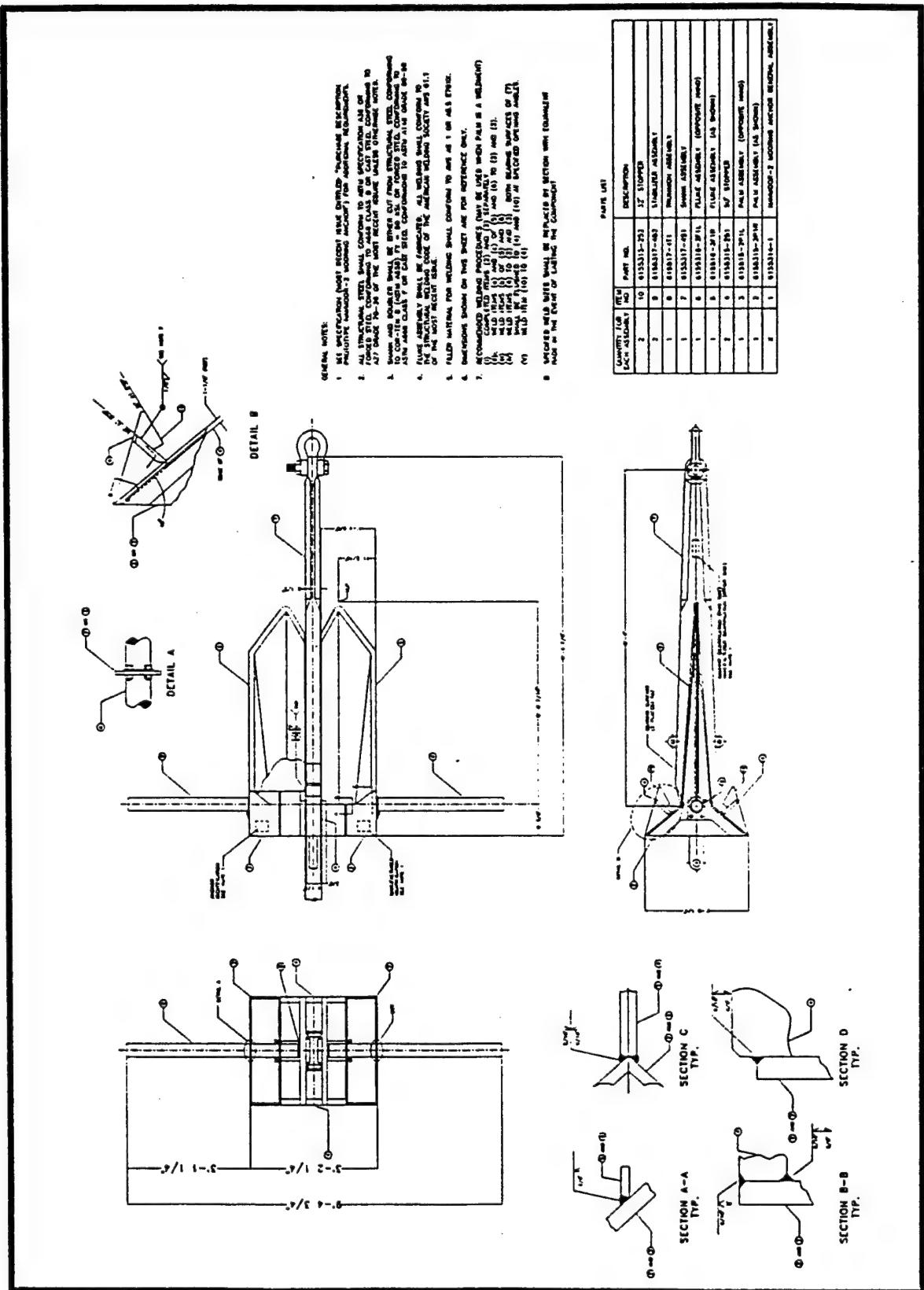
| Mooring Class | Mooring Capacity (kips) | Min. Fluke Weight (Nominal) for Ground Leg Options (lb) | | 4. Twin Chain, Tandem Anchor |
|------------------|-------------------------|---|--|---|
| | | 1. Single Chain, Single Anchor | 2. Single Chain, Tandem Anchor | |
| | |  |  |  |
| Mud ^c | Sand ^d | Mud | Sand | |
| AAA | 500 | | | 10,000 |
| BBB | 400 | | | 10,000 |
| AA | 300 | | | 15,000 |
| BB | 250 | | | 10,000 |
| CC | 200 | | | 10,000 |
| DD | 175 | 15,000 | 15,000 | |
| A | 150 | 15,000 | 10,000 | |
| B | 125 | 10,000 | 10,000 | |
| C | 100 | 10,000 | | |

^a Recommended anchor sizes provide system factor of safety of 1.75 to 2.25

^b Minimum anchor separations related to fluke length (L).

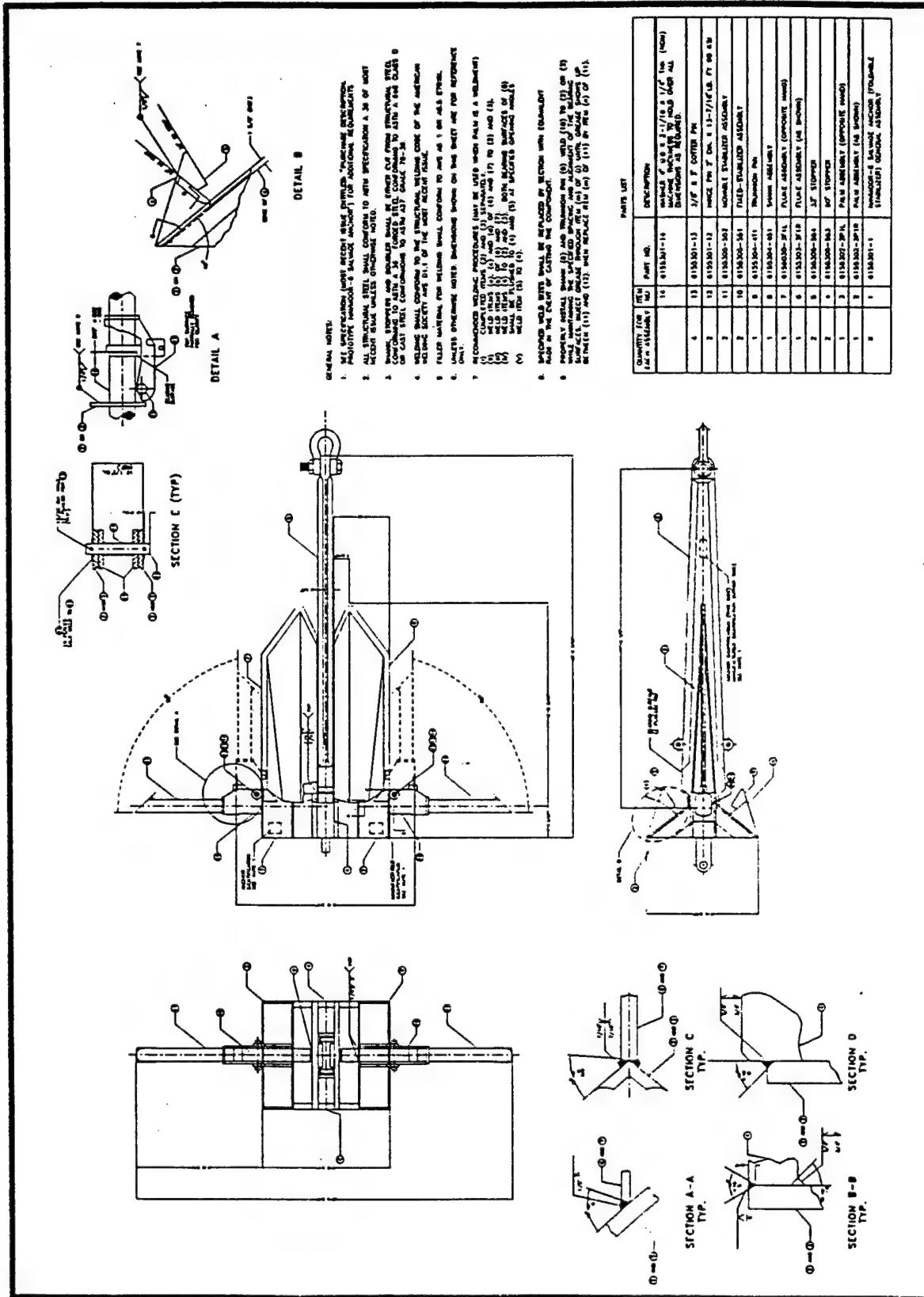
^c Includes very soft to soft silt and clay seafloors

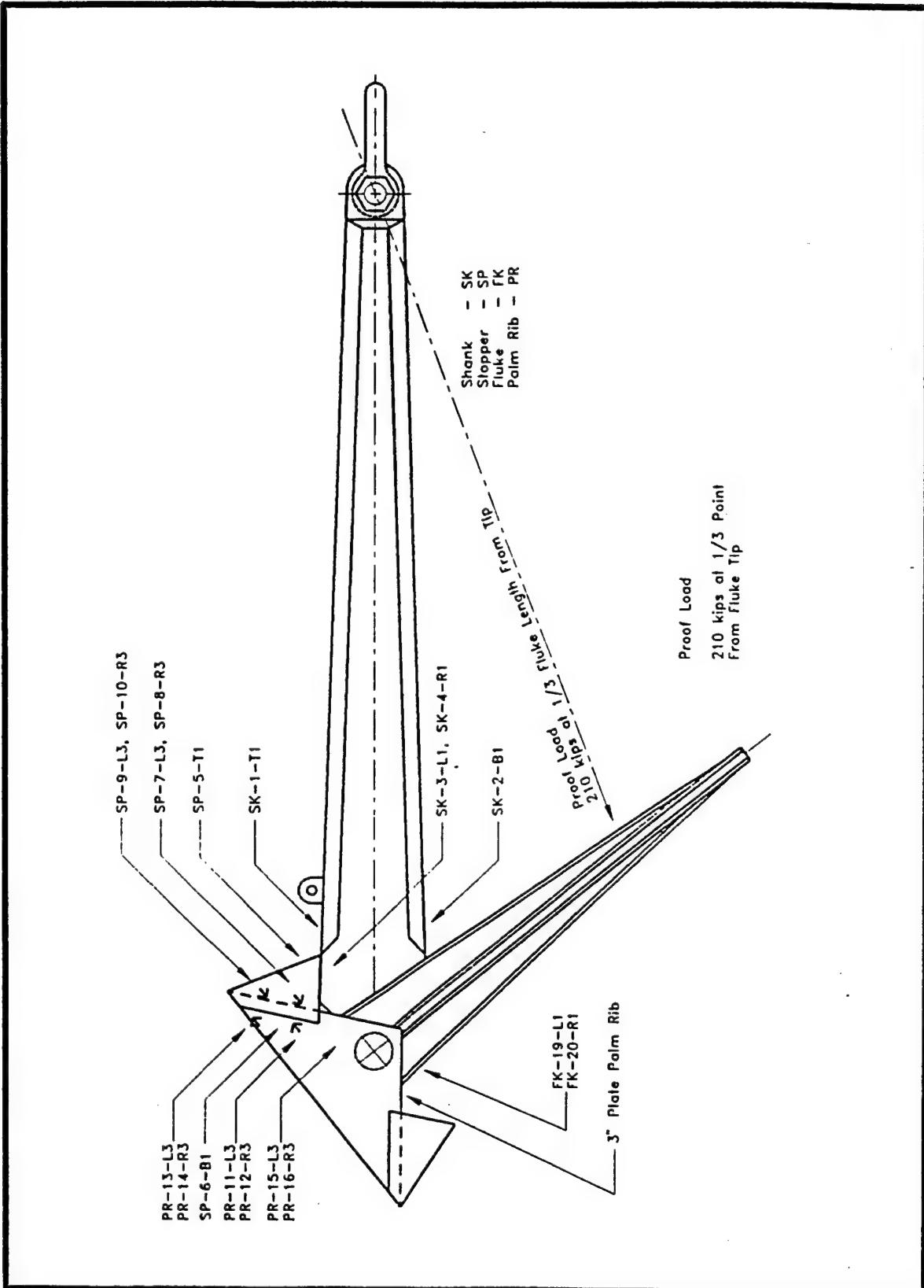
^d Includes sands and medium to stiff clay seafloors.



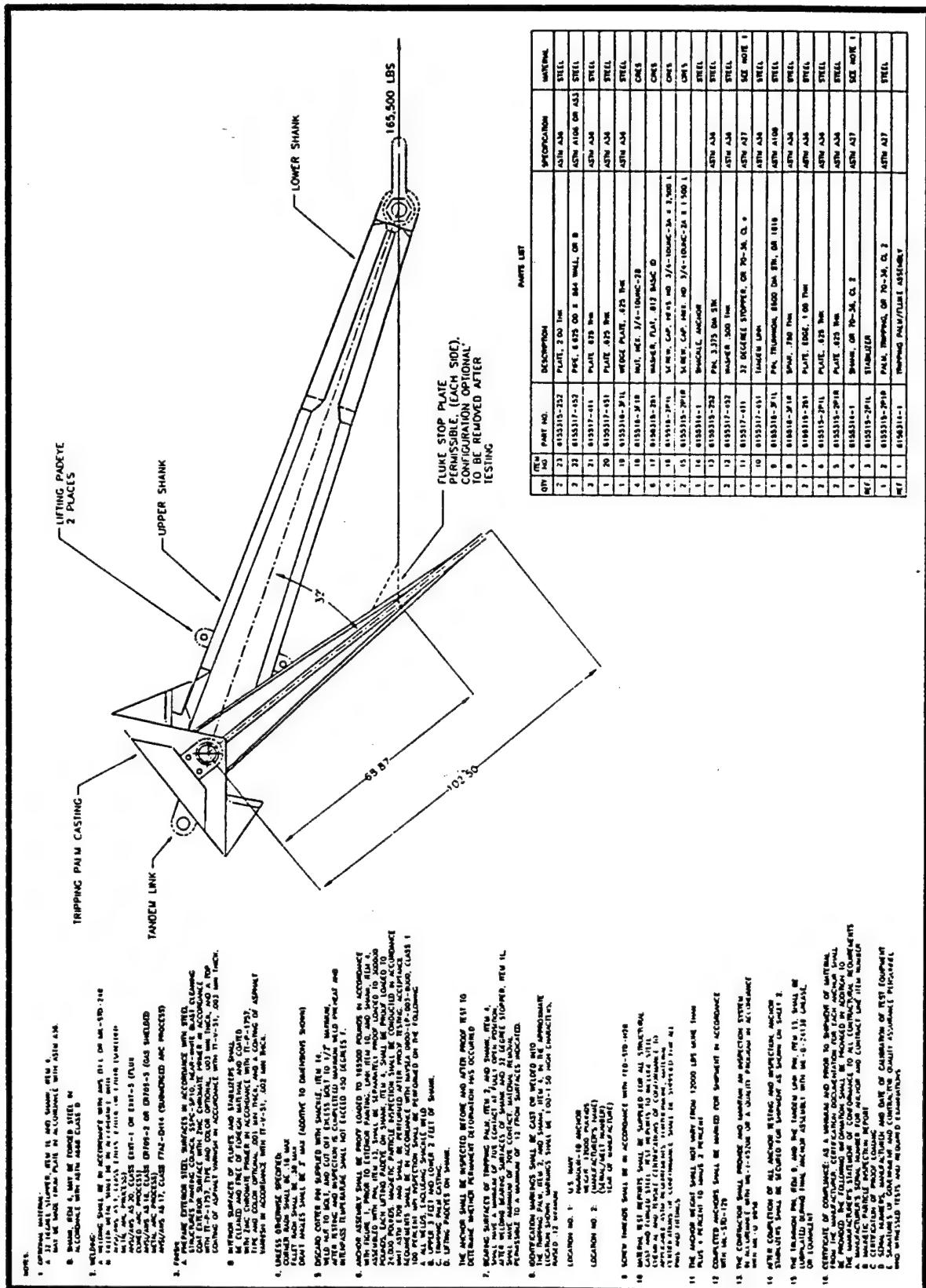
NAVMOOR-2 Mooring Anchor
2,400 lbs. (wt.)
General Assembly

NAVMOOR-U-SALVAGE, AUTHOR 7,200 DTS. (W.L.) Central Assembly

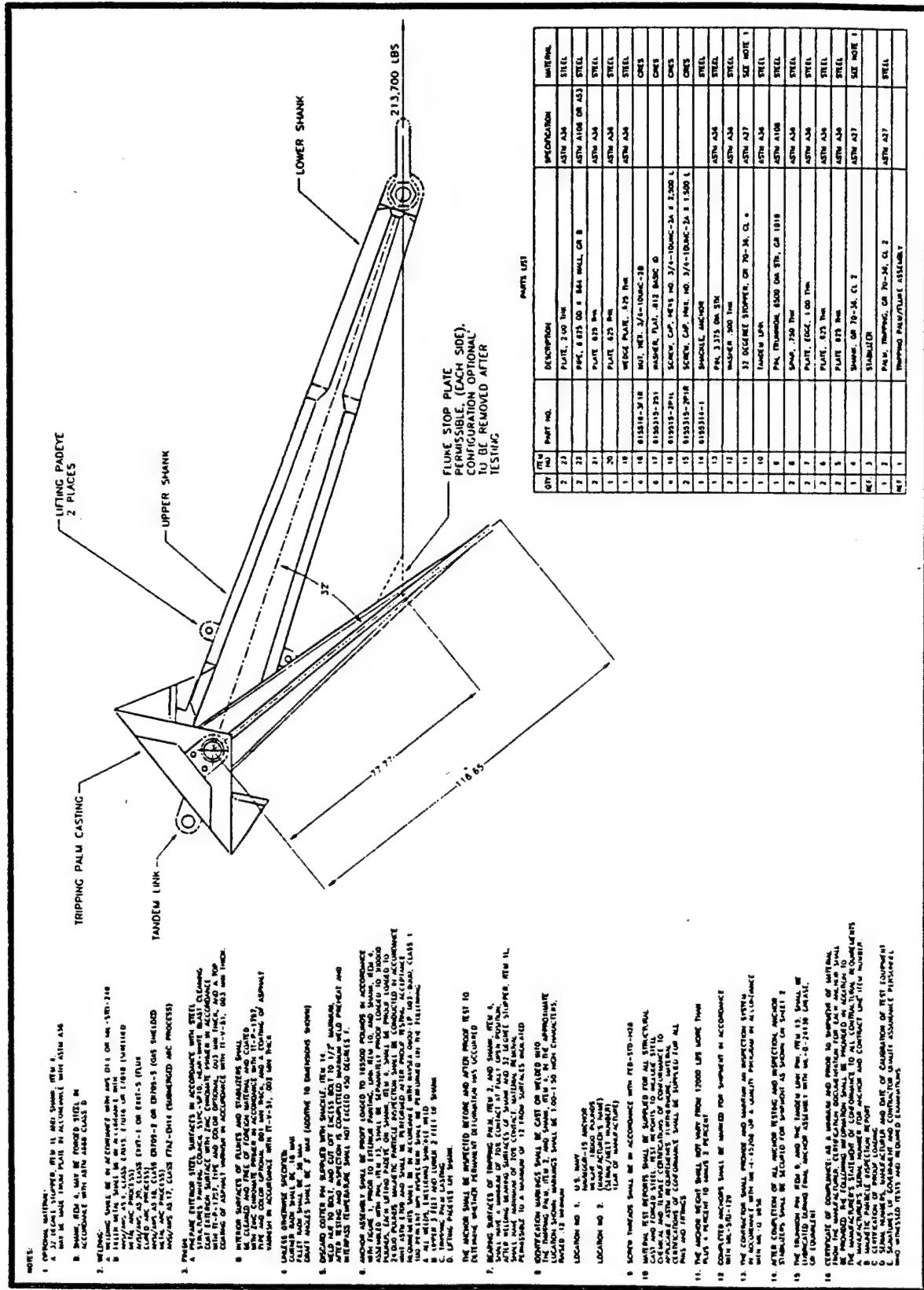




10K Navmoor Anvhor
Plan View



NAVMOOR-10, 12000 Pounds
Anchor Assembly, Mooring



NAVMOOR-15, 18000 Pounds
Anchor Assembly: Mooring

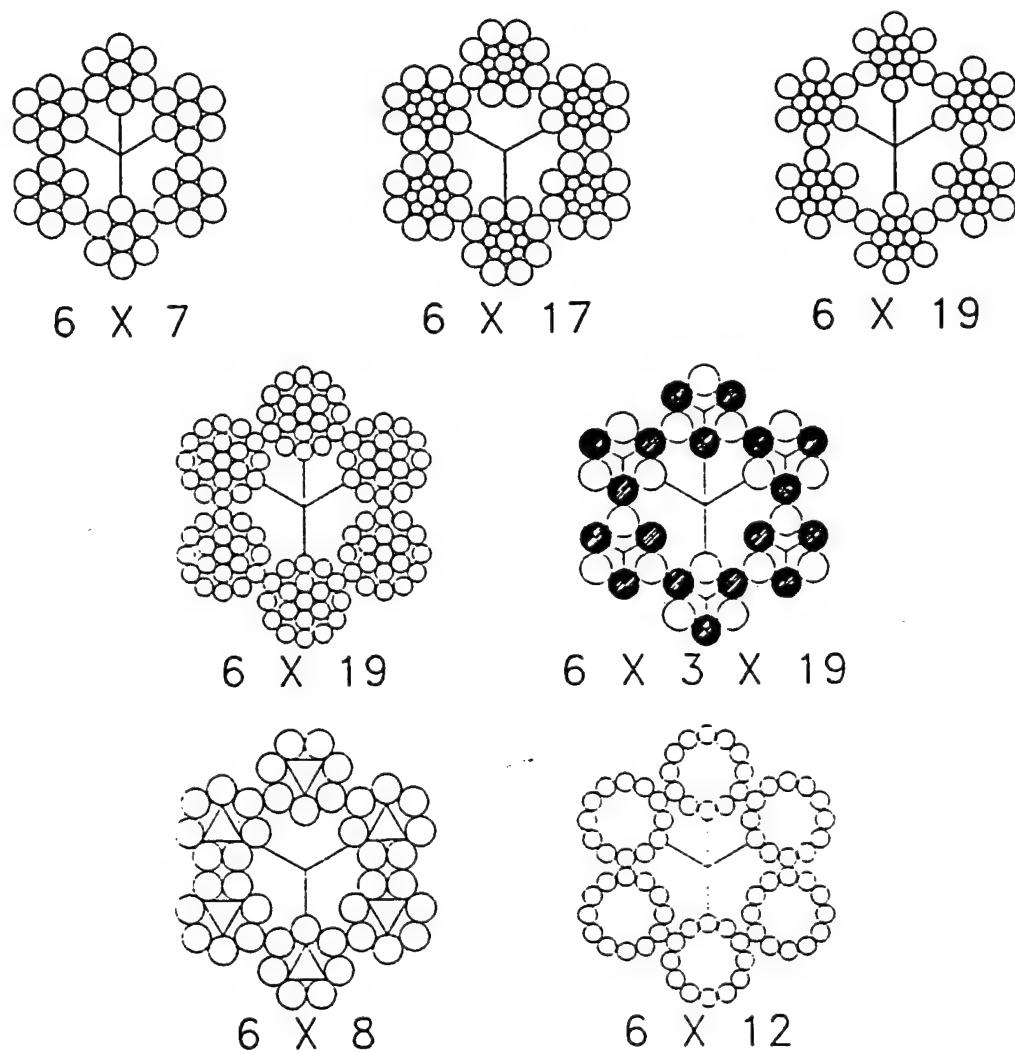


FIGURE 613-6
Common Wire Rope Construction Examples

TABLE 613-6
Fiber Rope Specification

| Type of Rope | Circumference
Inches | Specifications |
|--------------------------------------|-------------------------|-------------------|
| Untreated Manila | Up to 12 | FED Spec T-R--6-5 |
| Mildew Resistant Manila | Up to 12 | FED Spec T-T-616 |
| Jute | 5/8 to 6 | FED Spec T-R-650 |
| Polypropylene | Up to 10 | MIL-R-24049 |
| Nylon Three Strand | Up to 12 | MIL-R-17343 |
| Nylon Plaited | up to 16 | MIL-R-24337 |
| Nylon Double Braid | Up to 21 | MIL-R-204050 |
| Polyester Three Strand | Up to 12 | MIL-R-30500 |
| Polyester Plaited (Staple Wrap) | 3/4 to 4-1/2 | MIL-R-24537 |
| Polyester Double-Braid | Up to 21 | MIL-R-24677 |
| Polyester Double-Braid (Staple Wrap) | 3/4 to 5 | MIL-R-24536 |

TABLE 613-8
Plain-Laid Rope Construction

| Size
Circumference
Inches | Minimum Breaking Strength (Lbs) ¹ | | | | |
|---------------------------------|--|--------|---------------|--------------------|-----------|
| | Sisal | Manila | Polypropylene | Nylon ² | Polyester |
| 5/8 | 360 | 405 | 700 | 950 | 800 |
| 3/4 | 480 | 540 | 1,000 | 1,500 | 1,200 |
| 1 | 800 | 900 | 1,700 | 2,600 | 2,000 |
| 1-1/8 | 1,080 | 1,215 | 2,150 | 3,300 | 2,800 |
| 1-1/4 | 1,400 | 1,525 | 2,500 | 4,800 | 3,800 |
| 1-1/2 | 2,120 | 2,385 | 3,700 | 5,800 | 5,000 |
| 1-3/4 | 2,760 | 3,105 | 4,800 | 7,600 | 6,500 |
| 2 | 3,520 | 3,960 | 6,000 | 9,800 | 8,000 |
| 2-1/4 | 4,320 | 4,860 | 7,000 | 13,200 | 10,000 |
| 2-1/2 | 5,200 | 5,850 | 9,000 | 15,300 | 13,000 |
| 2-3/4 | | 6,930 | 11,000 | 19,000 | 15,000 |
| 3 | | 8,100 | 13,000 | 23,200 | 18,500 |
| 3-1/2 | | 10,800 | 16,500 | 32,000 | 25,000 |
| 3-3/4 | | 12,150 | 19,500 | 36,500 | |
| 4 | | 13,500 | 21,500 | 41,300 | 31,000 |
| 4-1/2 | | 16,650 | 26,000 | 50,000 | |
| 5 | | 20,250 | 32,000 | 60,000 | 48,000 |
| 4-1/2 | | 23,850 | 38,000 | 72,000 | |
| 6 | | 27,900 | 44,000 | 90,000 | 68,000 |
| 6-1/2 | | | 50,000 | 100,000 | |
| 7 | | 36,900 | 60,000 | 127,000 | 88,000 |
| 8 | | 46,800 | 75,000 | 164,000 | 110,000 |
| 9 | | 57,600 | 94,000 | 209,000 | 140,000 |
| 10 | | 69,300 | 115,000 | 265,000 | 165,000 |
| 11 | | 81,900 | | 316,000 | 240,000 |
| 12 | | 94,500 | | 375,000 | 285,000 |

NOTE:

¹Comparative strengths of various fiber ropes.

²The minimum breaking strength of nylon when wet is reduced approximately 15 percent.

TABLE 613-9
Braided Rope Construction

| Size
Circumference
Inches | Minimum Breaking Strength (lbs.) | | |
|---------------------------------|----------------------------------|-----------|---------|
| | Double Braided | | Plaited |
| | Nylon | Polyester | Nylon |
| 3/4 | 1,700 | 1,730 | 1,500 |
| 1 | 2,700 | 2,670 | 2,500 |
| 1-1/8 | 3.9 | 3,860 | 3,700 |
| 1-1/4 | 5,100 | 5,210 | 5,000 |
| 1-1/2 | 6,900 | 6,820 | 6,400 |
| 1-3/4 | 9,000 | 8,590 | 8,000 |
| 2 | 12,000 | 10,600 | 11,000 |
| 2-1/4 | 15,000 | 15,100 | 17,000 |
| 2-1/2 | 18,400 | 17,800 | 20,000 |
| 2-3/4 | 22,500 | 20,600 | 24,000 |
| 3 | 26,500 | 26,800 | 31,000 |
| 3-1/2 | 36,000 | 33,900 | 38,000 |
| 3-3/4 | 42,000 | 41,700 | 46,000 |
| 4 | 48,000 | 46,000 | 53,000 |
| 4-1/2 | 60,000 | 59,900 | 63,000 |
| 5 | 73,000 | 69,900 | 73,000 |
| 5-1/2 | 90,000 | 81,200 | 78,000 |
| 6 | 102,000 | 106,000 | 95,000 |
| 6-1/2 | 123,000 | 119,000 | 106,000 |
| 7 | 140,000 | 133,000 | 125,000 |
| 7-1/2 | 160,000 | 164,000 | 137,000 |
| 8 | 180,000 | 181,000 | 165,000 |
| 9 | 225,000 | 236,000 | 200,000 |
| 10 | 273,000 | 277,000 | 250,000 |
| 11 | 325,000 | 343,000 | 300,000 |
| 12 | 385,000 | 417,000 | 360,000 |

TABLE 613-9
Braided Rope Construction - Continued

| Size
Circumference
Inches | Minimum Breaking Strength (Lbs) ¹ | | |
|---------------------------------|--|-----------|--------------------|
| | Double Braided | | Plaited |
| | Nylon ² | Polyester | Nylon ² |
| 13 | 440,000 | 470,000 | 380,000 |
| 14 | 508,000 | 527,000 | 441,000 |
| 15 | 576,000 | 649,000 | 507,000 |
| 16 | 650,000 | 715,000 | 572,000 |
| 17 | 726,000 | 784,000 | |
| 18 | 808,000 | 931,000 | |
| 19 | 893,000 | 1,012,000 | |
| 20 | 980,000 | 1,091,000 | |
| 21 | 1,070,000 | 1,263,000 | |

NOTE:

¹Comparative strengths of various fiber ropes for current minimum breaking strength of each type, consult the MIL-Spec.

²The minimum breaking of nylon when wet is reduced approximately 15 percent.

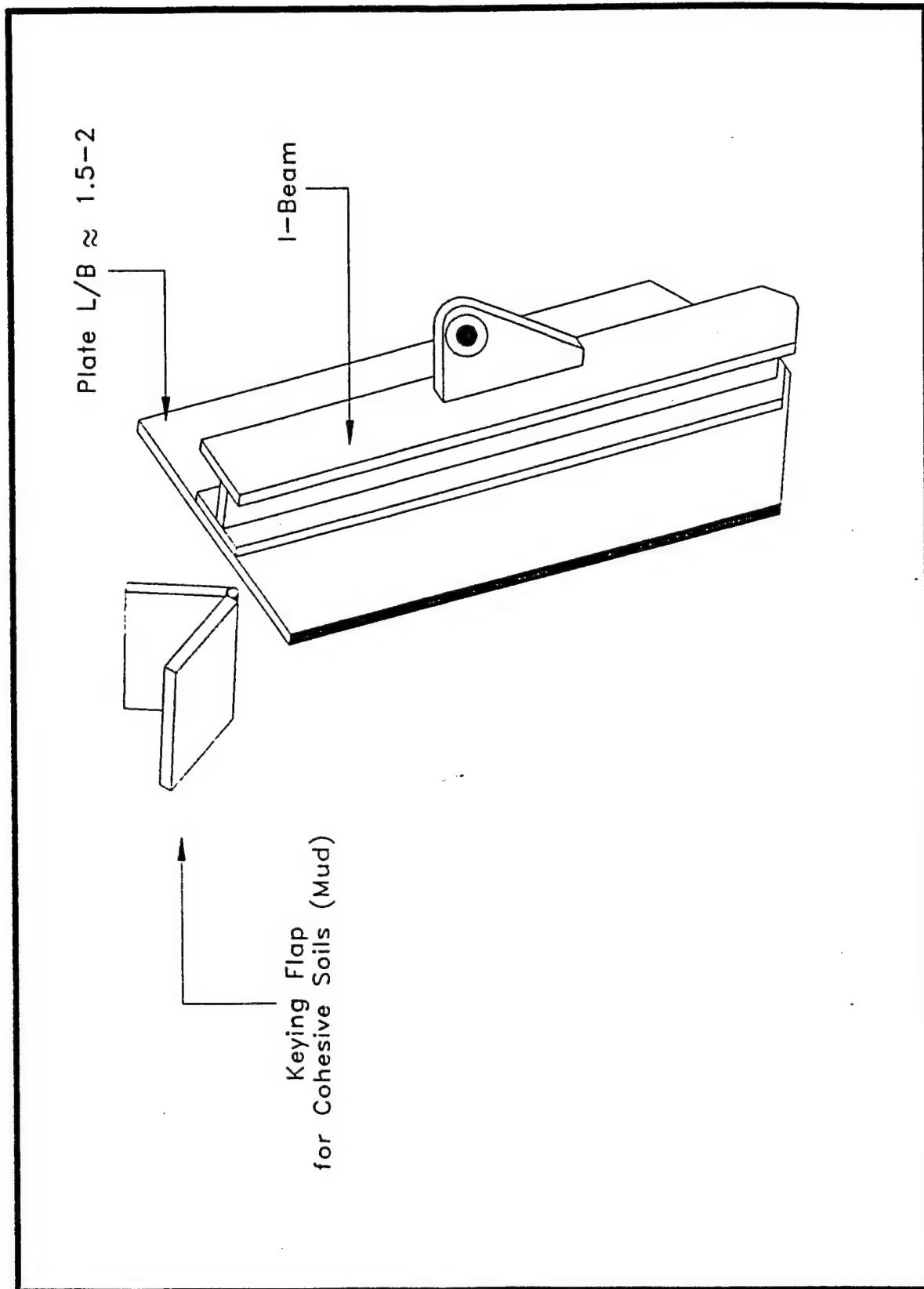
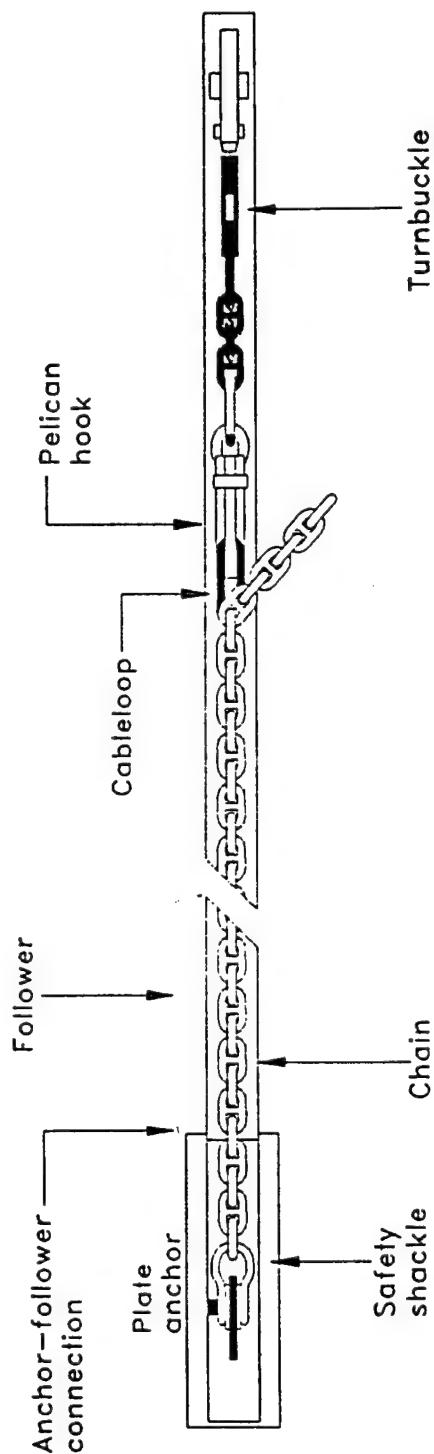


FIGURE 3
Driven Plate Anchor Configuration



Anchor-Follower Assembly

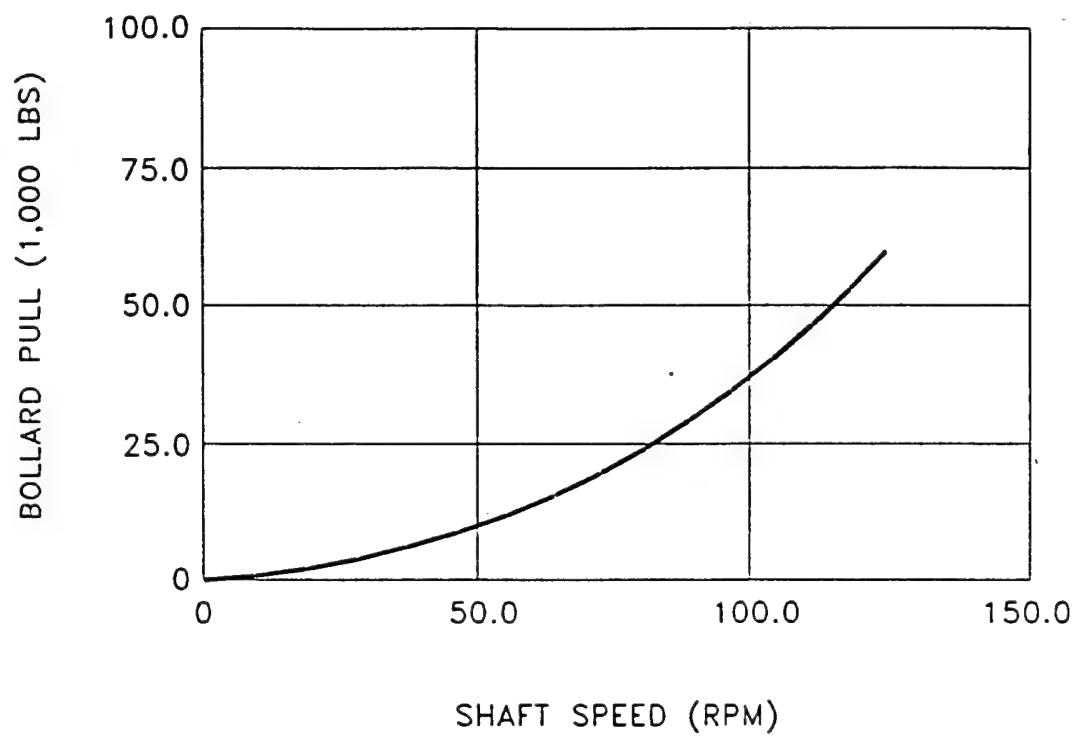


FIGURE J-1
Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships

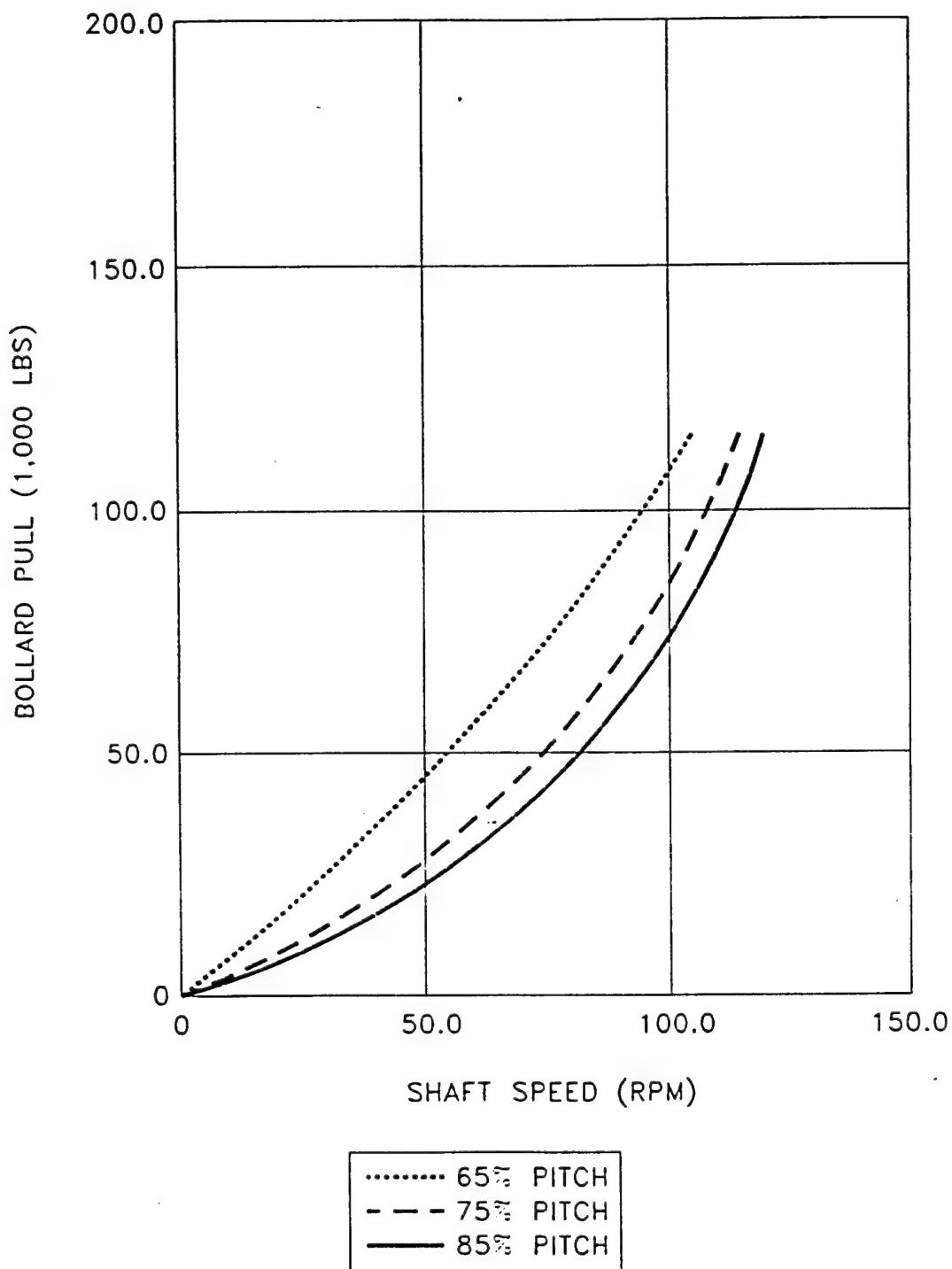
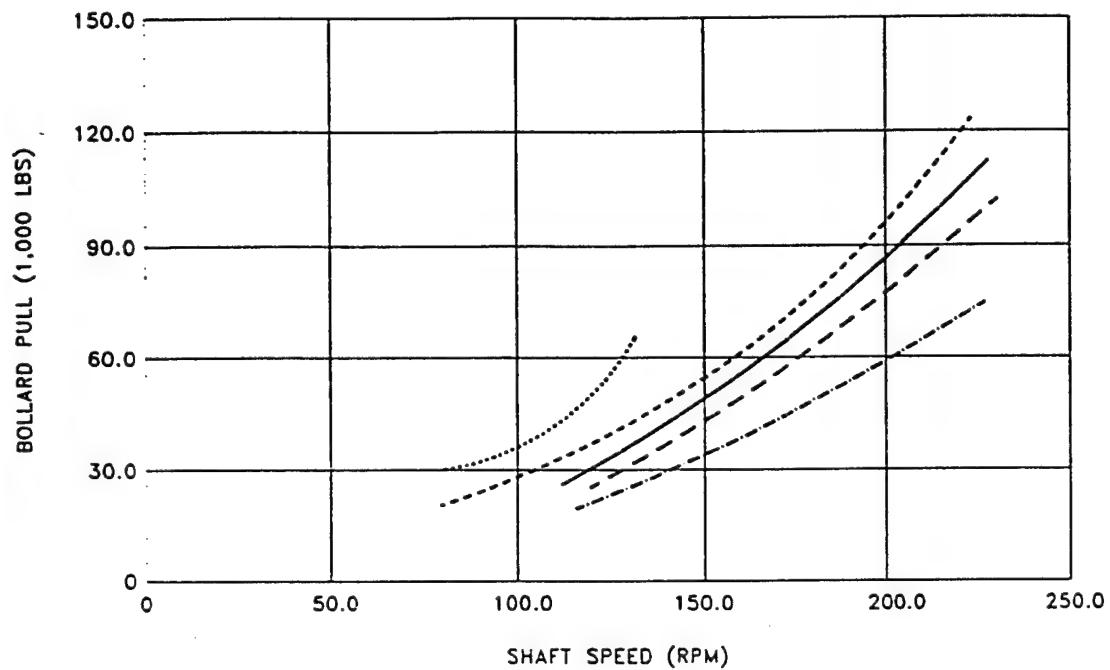


FIGURE J-2
Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships



NOTE:

These performance curves are not typical of all T-ATF-169 Class tugs. Some ships of this class are fitted with Kort nozzles.

| PITCH (FT) |
|------------|
| 6.5 |
| 8.0 |
| 9.0 |
| 10.0 |
| 12.5 |

FIGURE J-3
Bollard Pull vs. Shaft Speed and Propeller Pitch
For T-ATF-169 Class Ship Without Kort Nozzle

TABLE 1
Chocks for Nylon Rope (4)

| Chock size
in. | Breaking strength
of rope
lb | Breaking strength
of rope
kN | A
in. | E
in. | F
in. | Chock weight
lb | Chock weight
kg |
|-------------------|------------------------------------|------------------------------------|----------|----------|----------|--------------------|--------------------|
| 6 | 152 | 22,000 | 98 | 4-1/2 | 92 | 165 | 23 |
| 8 | 203 | 37,500 | 167 | 5-1/2 | 114 | 203 | 36 |
| 10 | 254 | 54,400 | 242 | 6 | 152 | 241 | 54 |
| 12 | 305 | 74,000 | 329 | 7 | 178 | 279 | 82 |
| 14 | 356 | 110,000 | 489 | 8 | 203 | 305 | 104 |
| 16 | 406 | 137,000 | 609 | 9 | 229 | 356 | 163 |
| 18 | 475 | 170,000 | 756 | 10 | 254 | 381 | 213 |
| 20 | 508 | 200,000 | 890 | 10-1/2 | 267 | 406 | 249 |

Notes

1. Chock shall be set parallel to baseline
otherwarships and shall follow sheer in force
and aft direction.
2. Chock is designed for use with nylon rope as
shown in table. Chock shall withstand a
horizontal endwise pull equal to double the
minimum breaking strength of 2 parts of the
specified size of nylon rope applied one
inch above the centerline of the chock. The
chock shall also withstand an upward load of
50,000 pounds applied at its midpoint.

(4) NAVSHIPS Drawing 805-1843363, Chocks for nylon rope.

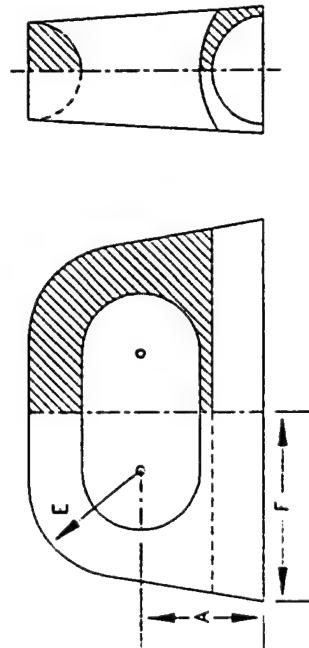
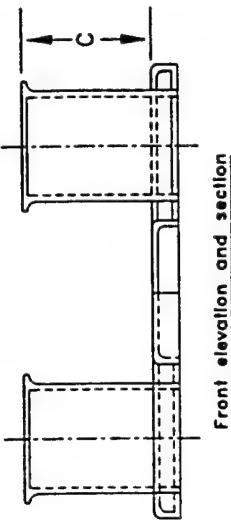


TABLE 2
Bitts for Nylon Rope (5)

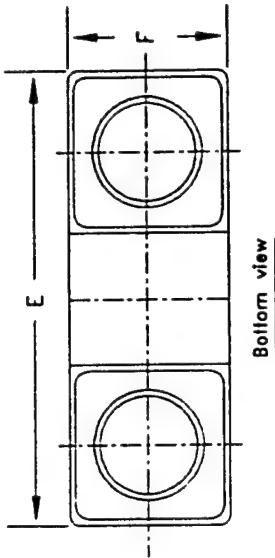
| Nominal
bit size
in. | Maximum size of
nylon rope
in. | Maximum allowable
moment
in.-lb (000) | Maximum allowable
moment
kNm | C
in. | E
in. | F
in. | Approximate
weight
lb
kg | | | | | | |
|----------------------------|--------------------------------------|---|------------------------------------|----------|----------|----------|-----------------------------------|--------|------|--------|-----|-----|-----|
| 4 | 102 | 3-1/2 | 89 | 142.5 | 16.10 | 10 | 254 | 16-1/2 | 419 | 7-1/2 | 191 | 80 | 36 |
| 6 | 152 | 6 | 152 | 481.0 | 54.35 | 13 | 330 | 24-1/8 | 613 | 11-1/8 | 283 | 210 | 95 |
| 8 | 203 | 7 | 178 | 770.0 | 87.00 | 14 | 355 | 30-5/8 | 778 | 13-5/8 | 346 | 320 | 145 |
| 10 | 254 | 9 | 228 | 1490.0 | 168.35 | 17 | 432 | 39-1/4 | 997 | 17-1/4 | 438 | 580 | 263 |
| 12 | 305 | 10 | 254 | 2110.0 | 238.40 | 21 | 533 | 45-1/4 | 1150 | 20-1/4 | 514 | 870 | 395 |

Notes

1. The maximum moment is the product of the breaking strength of the rope times half the height of the barrel above the base plate.
2. Bitts are designed for a yield stress of 24,000 lb/in² based on the maximum moment.



Front elevation and section

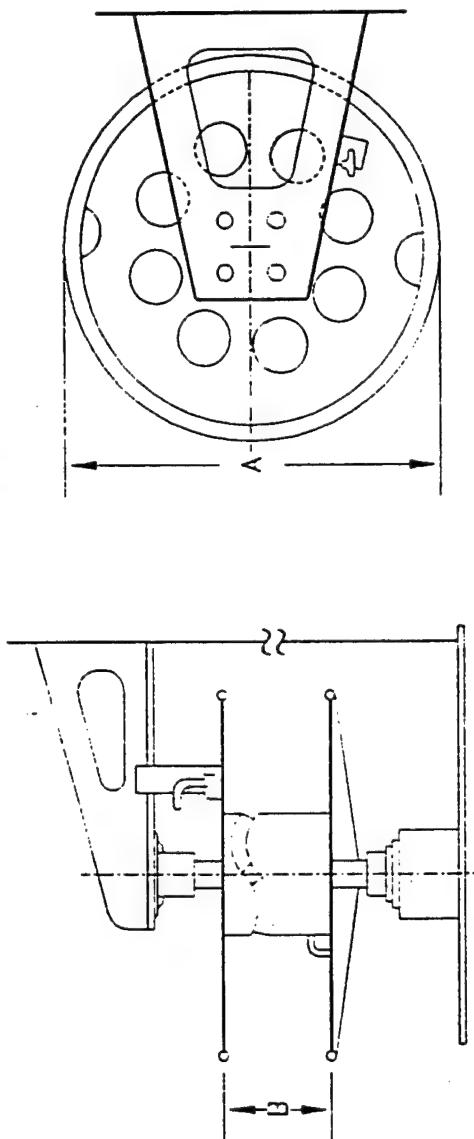


Bottom view

(5) NAVSHIPS Drawing 804-1843362, Bitts for nylon rope.

TABLE 3
Vertical Hawser Reels (6)

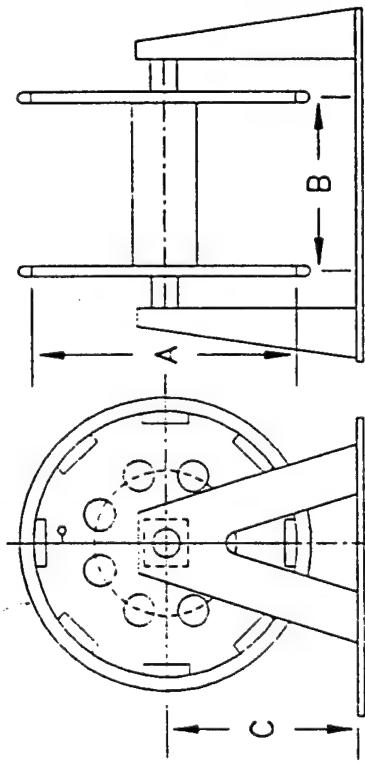
| Reel type | Rope size | Capacity | A | | B | | Approx assy weight | | Approx rope weight | | |
|-----------|-----------|----------|-----|----|------|----|--------------------|-----|--------------------|------|-----|
| | | | in. | mm | in. | mm | lb | kg | lb | kg | |
| I | 6 | 152 | 100 | 30 | 762 | 72 | 1829 | 285 | 129 | 648 | 294 |
| | 6 | 152 | 120 | 30 | 762 | 72 | 1829 | 285 | 129 | 778 | 353 |
| | 7 | 178 | 100 | 30 | 762 | 72 | 1829 | 285 | 129 | 876 | 397 |
| II | 7 | 178 | 120 | 34 | 864 | 66 | 1676 | 325 | 147 | 1050 | 476 |
| | 8 | 203 | 80 | 34 | 864 | 66 | 1676 | 325 | 147 | 935 | 424 |
| | 8 | 203 | 100 | 38 | 965 | 66 | 1676 | 400 | 181 | 1128 | 512 |
| III | 8 | 203 | 120 | 38 | 965 | 66 | 1676 | 400 | 181 | 1352 | 613 |
| | 10 | 254 | 80 | 38 | 965 | 66 | 1676 | 400 | 181 | 1440 | 653 |
| IV | 10 | 254 | 100 | 45 | 1143 | 66 | 1676 | 460 | 209 | 1798 | 816 |
| V | 10 | 254 | 120 | 50 | 1270 | 66 | 1676 | 510 | 231 | 2154 | 977 |



(6) NAVSHIPS Drawings S2604-921842. Vertical hawser reels for manila rope.

TABLE 4
Horizontal Hawser Reels (7)

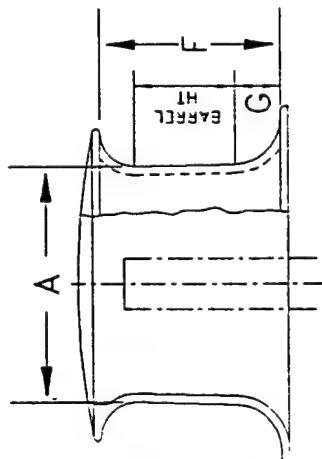
| Reel type | Rope size | Capacity | A | B | C | Approx. rope weight | Approx. rope weight |
|-----------|-----------|----------|--------|--------|--------|------------------------------|------------------------------|
| | in. mm | fathoms | in. mm | in. mm | in. mm | lb kg | lb kg |
| A | 3 76 | 300 | 32 813 | 38 965 | 21 533 | 150 485 | 220 485 |
| | 4 102 | 167 | 32 813 | 38 965 | 21 533 | 150 485 | 220 485 |
| | 5 127 | 100 | 32 813 | 38 965 | 21 533 | 150 485 | 220 485 |
| B | 6 152 | 100 | 38 | 965 | 39 | 991 24 610 380 172 875 397 | 991 24 610 380 172 875 397 |
| C | 7 178 | 100 | 38 | 965 | 39 | 991 24 610 380 172 875 397 | 991 24 610 380 172 875 397 |
| | 8 203 | 100 | 38 | 965 | 52 | 1321 24 610 440 200 1150 522 | 1321 24 610 440 200 1150 522 |



(7) NAVSHIPS Drawing S2604-921841, Horizontal hawser reels for monila rope.

TABLE 5
Capstan Head Sizes for Nylon Ropes (8)

| Nylon rope circumference
in. | Λ (Barrel diameter)
mm | F
in. | G
in. | Barrel height
in. | Nylon rope wrap height
in. |
|---------------------------------|---------------------------|----------|----------|----------------------|-------------------------------|
| 3 | 76 | 1.2 | 305 | 9.6 | 244 |
| 3-1/2 - 4 | 89-102 | 1.5 | 381 | 12.0 | 305 |
| 4-1/2 | 114 | 1.8 | 457 | 14.4 | 366 |
| 5 - 5-1/2 | 127-140 | 2.1 | 533 | 16.8 | 427 |
| 6 - 6-1/2 | 152-164 | 2.4 | 610 | 19.2 | 488 |
| 6 | 178 | 2.7 | 686 | 21.6 | 549 |
| 7 | 203 | 3.0 | 762 | 24.0 | 610 |
| 8 | 229 | 3.6 | 914 | 28.8 | 732 |
| 9 | | | | 7.5 | 190 |



(8) NAVSHIPS Drawings S2601-860303, Capstan & gypsy heads.

Three-Strand Nylon Rope
MIL-R-17343

| Circumference | inches | mm | Breaking strength | | Standard length | | NSN
(4020-00-) |
|----------------------|---------------|-----------|--------------------------|-----------|------------------------|----------|--------------------------|
| | | | lb | kN | feet | m | |
| 5/8 | 16 | | 950 | 4.20 | 700 | 213 | 541-7075* |
| 5/8 | 16 | | 950 | 4.20 | 1200 | 365 | 263-3483* |
| 5/8 | 16 | | 950 | 4.20 | 2250 | 685 | 701-3044 |
| 5/8 | 16 | | 950 | 4.20 | 2250 | 685 | 242-4083* |
| 5/8 | 16 | | 950 | 4.20 | 100 | 30 | 270-8245* |
| 3/4 | 19 | | 1500 | 6.65 | 2250 | 685 | 618-0261 |
| 3/4 | 19 | | 1500 | 6.65 | 900 | 274 | 523-9461 |
| 3/4 | 19 | | 1500 | 6.65 | 600 | 182 | 542-2523* |
| 3/4 | 19 | | 1500 | 6.65 | 200 | 61 | 929-0058* |
| 1 | 25 | | 2600 | 11.55 | 2250 | 685 | 641-8898 |
| 1 | 25 | | 2600 | 11.55 | 42 | 12 | 593-9584 |
| 1-1/8 | 29 | | 3300 | 14.65 | 1620 | 493 | 842-2431* |
| 1-1/8 | 29 | | 3300 | 14.65 | 1620 | 493 | 641-8899 |
| 1-1/4 | 32 | | 4800 | 21.35 | 1200 | 365 | 753-2886 |
| 1-1/4 | 32 | | 4800 | 21.35 | 50 | 15 | 530-2701 |
| 1-1/2 | 38 | | 5800 | 25.80 | 1200 | 365 | 641-8900 |
| 1-1/2 | 38 | | 5800 | 25.80 | 300 | 91 | 741-3154 |
| 1-3/4 | 44 | | 7600 | 33.60 | 1200 | 365 | 560-7732 |
| 2 | 51 | | 9800 | 43.80 | 1200 | 365 | 753-2897 |
| 2-1/4 | 57 | | 13200 | 56.70 | 125 | 38 | 585-2530 |
| 2-1/2 | 64 | | 15300 | 68.05 | 1200 | 365 | 573-2886 |
| 2-3/4 | 70 | | 19000 | 84.50 | 1200 | 365 | 174-1231 |
| 3 | 76 | | 23200 | 103.20 | 1200 | 365 | 752-8878 |
| 3-1/2 | 89 | | 3200 | 142.30 | 1200 | 365 | 174-1232 |
| 4 | 102 | | 41300 | 183.70 | 600 | 182 | 752-8879 |
| 4-1/2 | 114 | | 50000 | 222.40 | 600 | 182 | 542-3306 |
| 5 | 127 | | 60000 | 266.90 | 600 | 182 | 752-8880 |
| 5-1/2 | 140 | | 72000 | 320.25 | 600 | 182 | 542-3307 |
| 6 | 152 | | 90000 | 400.35 | 600 | 182 | 542-3308 |
| 6-1/2 | 165 | | 109000 | 444.82 | 600 | 182 | 843-6306 |
| 7 | 178 | | 127000 | 564.90 | 600 | 182 | 752-8881 |
| 8 | 203 | | 164000 | 729.50 | 720 | 219 | 752-8892 |
| 8 | 203 | | 164000 | 729.50 | 600 | 182 | 892-4028 |
| 9 | 229 | | 209000 | 929.65 | 600 | 182 | 842-7466 |
| 10 | 254 | | 265000 | 1178.75 | 600 | 182 | 843-6307 |

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Plaited Nylon
MIL-R-24337

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|-----------|--------------------------|-----------|------------------------|----------|--------------------|
| <u>inches</u> | <u>mm</u> | <u>lb</u> | <u>kN</u> | <u>feet</u> | <u>m</u> | <u>m(4020-00-)</u> |
| 3/4 | 19 | 1,500 | 6.70 | 2250 | 685 | 106-9384 |
| 1 | 25 | 2,400 | 10.70 | 2250 | 685 | 106-9388 |
| 1-1/8 | 29 | 3,300 | 14.70 | 1620 | 494 | 106-9389 |
| 1-1/4 | 32 | 4,800 | 21.40 | 1200 | 365 | 106-9390 |
| 1-1/2 | 38 | 6,200 | 27.60 | 1200 | 365 | 106-9391 |
| 1-3/4 | 44 | 7,700 | 34.30 | 1200 | 365 | 106-9392 |
| 2 | 51 | 10,000 | 44.50 | 1200 | 365 | 106-9393 |
| 2-1/4 | 57 | 13,800 | 61.40 | 1200 | 365 | 106-9394 |
| 2-1/2 | 64 | 16,000 | 71.20 | 1200 | 365 | 106-9395 |
| 2-3/4 | 70 | 19,000 | 84.50 | 1200 | 365 | 106-9396 |
| 3 | 76 | 25,000 | 111.20 | 1200 | 365 | 106-9397 |
| 3-1/2 | 89 | 33,000 | 146.80 | 1200 | 365 | 106-9398 |
| 3-3/4 | 92 | 38,000 | 169.00 | 600 | 182 | 106-9399 |
| 4 | 102 | 43,000 | 191.30 | 600 | 182 | 106-9464 |
| 4-1/2 | 114 | 50,000 | 222.40 | 600 | 182 | 106-9400 |
| 5 | 127 | 60,000 | 266.90 | 600 | 182 | 106-9401 |
| 5-1/2 | 140 | 75,000 | 333.60 | 600 | 182 | 106-9261 |
| 6 | 152 | 86,000 | 382.50 | 600 | 182 | 106-9298 |
| 6-1/2 | 165 | 98,000 | 435.90 | 600 | 182 | 106-9333 |
| 7 | 178 | 117,000 | 520.40 | 600 | 182 | 106-9334 |
| 7-1/2 | 191 | 134,000 | 596.10 | 600 | 182 | 106-9335 |
| 8 | 203 | 153,000 | 630.60 | 600 | 182 | 106-9336 |
| 9 | 229 | 192,000 | 854.10 | 600 | 182 | 106-9337 |
| 10 | 254 | 237,000 | 1054.20 | 600 | 182 | 106-9338 |
| 11 | 279 | 280,000 | 1245.50 | 500 | 152 | 106-9339 |
| 12 | 305 | 345,000 | 1534.60 | 400 | 122 | 106-9340 |

Double Braided Nylon Rope
MIL-R-24050

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|-----|--------------------------|---------|------------------------|-----|-------------|
| inches | mm | lb | kN | feet | m | (4020-) |
| 3/4 | 19 | 1,700 | 7.55 | 600 | 182 | 00-106-9342 |
| 1 | 25 | 2,700 | 12.00 | 600 | 182 | 00-106-9341 |
| 1-1/8 | 29 | 3,900 | 17.30 | 600 | 182 | 00-946-0436 |
| 1-1/4 | 32 | 5,100 | 22.70 | 600 | 182 | 00-926-4529 |
| 1-1/2 | 38 | 6,900 | 30.70 | 600 | 182 | 00-106-9361 |
| 1-3/4 | 44 | 9,000 | 40.00 | 600 | 182 | 00-106-9364 |
| 2 | 51 | 12,000 | 53.40 | 600 | 182 | 00-106-9402 |
| 2 | 51 | 12,000 | 53.40 | 480 | 146 | 01-025-5175 |
| 2 | 51 | 12,000 | 53.40 | 300 | 91 | 01-025-5176 |
| 2 | 51 | 12,000 | 53.40 | 180 | 54 | 10-025-5177 |
| 2-1/4 | 57 | 15,000 | 66.70 | 600 | 182 | 00-106-9403 |
| 1-1/2 | 64 | 18,400 | 81.80 | 600 | 182 | 00-106-9404 |
| 2-3/4 | 70 | 22,500 | 100.10 | 600 | 182 | 00-106-9405 |
| 2-3/4 | 70 | 22,500 | 100.10 | 900 | 274 | 01-025-5172 |
| 2-3/4 | 70 | 22,500 | 100.10 | 300 | 91 | 01-025-5173 |
| 2-3/4 | 70 | 22,500 | 100.10 | 200 | 61 | 01-025-5174 |
| 3 | 76 | 26,500 | 117.90 | 600 | 182 | 00-471-9336 |
| 3-1/2 | 89 | 36,000 | 160.10 | 600 | 182 | 00-519-7916 |
| 3-3/4 | 92 | 42,000 | 186.80 | 600 | 182 | 00-106-9406 |
| 4 | 102 | 48,000 | 213.50 | 600 | 182 | 00-106-9407 |
| 4 | 102 | 48,000 | 213.50 | 900 | 274 | 01-025-5170 |
| 4 | 102 | 48,000 | 213.50 | 300 | 91 | 01-025-5171 |
| 4-1/2 | 114 | 60,000 | 266.90 | 600 | 182 | 00-106-9408 |
| 5 | 127 | 73,000 | 314.70 | 600 | 182 | 00-106-9409 |
| 5-1/2 | 140 | 90,000 | 400.30 | 600 | 182 | 00-106-9410 |
| 5-1/2 | 140 | 90,000 | 400.30 | 900 | 274 | 01-025-5178 |
| 5-1/2 | 140 | 90,000 | 400.30 | 300 | 91 | 01-025-5180 |
| 6 | 152 | 101,500 | 455.90 | 600 | 182 | 00-106-9411 |
| 6-1/2 | 165 | 123,000 | 547.10 | 600 | 182 | 00-106-9412 |
| 7 | 178 | 140,000 | 622.80 | 600 | 182 | 00-519-7946 |
| 7-1/2 | 191 | 160,000 | 711.80 | 600 | 182 | 00-486-6009 |
| 8 | 203 | 160,000 | 700.70 | 600 | 182 | 00-003-6293 |
| 8 | 203 | 160,000 | 700.70 | 1200 | 365 | 01-025-5179 |
| 9 | 229 | 225,000 | 1000.80 | 600 | 182 | 00-519-7951 |
| 10 | 254 | 273,000 | 1214.40 | 600 | 182 | 00-519-7960 |
| 11 | 279 | 325,000 | 1445.70 | 600 | 182 | 00-519-7980 |
| 12 | 305 | 365,000 | 1712.60 | 600 | 182 | 00-519-7992 |

Plaited Continuous Polyester Filament with Staple Wrap
MIL-R-24537

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|-----|--------------------------|--------|------------------------|-----|------------|
| inches | mm | lb | kN | feet | m | (4020-01-) |
| 3/4 | 19 | 2,080 | 9.30 | 2250 | 685 | 029-2778 |
| 1 | 25 | 2,980 | 13.30 | 2250 | 685 | 028-3842 |
| 1-1/8 | 29 | 3,970 | 17.70 | 1620 | 493 | 028-3825 |
| 1-1/4 | 32 | 5,050 | 22.50 | 1200 | 365 | 028-3828 |
| 1-1/2 | 38 | 6,400 | 28.50 | 400 | 122 | 028-3826 |
| 1-1/2 | 38 | 6,400 | 28.50 | 800 | 244 | 028-3829 |
| 1-1/2 | 38 | 6,400 | 28.50 | 1200 | 365 | 028-3830 |
| 1-1/2 | 38 | 6,400 | 28.50 | 200 | 61 | 028-3843 |
| 1-3/4 | 44 | 8,100 | 36.00 | 1200 | 365 | 028-3839 |
| 2 | 51 | 9,900 | 44.00 | 1200 | 365 | 028-3831 |
| 2-1/4 | 57 | 12,200 | 54.30 | 1200 | 365 | 029-8664 |
| 1-1/2 | 64 | 14,500 | 64.60 | 1200 | 365 | 028-3832 |
| 2-3/4 | 70 | 16,700 | 74.30 | 1200 | 365 | 028-3833 |
| 3 | 76 | 19,000 | 84.50 | 400 | 122 | 028-3834 |
| 3 | 76 | 19,000 | 84.50 | 600 | 182 | 028-3835 |
| 3 | 76 | 19,000 | 84.50 | 1200 | 365 | 028-3841 |
| 3-1/4 | 83 | 22,000 | 97.90 | 200 | 61 | 028-3836 |
| 3-1/2 | 89 | 25,000 | 111.20 | 1200 | 365 | 028-3837 |
| 3-3/4 | 92 | 27,500 | 122.30 | 600 | 182 | 028-3840 |
| 4 | 102 | 30,700 | 136.60 | 600 | 162 | 028-3838 |
| 4-1/2 | 114 | 37,000 | 164.60 | 600 | 182 | 028-3827 |

Three-Strand Polyester

MIL-R-30500

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|-----|--------------------------|--------|------------------------|-----|--------------|
| inches | mm | lb | kN | feet | m | (4020-) |
| 5/8 | 16 | 800 | 3.60 | 2700 | 823 | 00-202-1345* |
| 5/8 | 16 | 800 | 3.60 | 50 | 15 | 00-659-8923 |
| 3/4 | 19 | 1,200 | 5.30 | 2250 | 685 | 00-536-3476* |
| 1 | 25 | 2,500 | 11.10 | 24 | 7 | 00-180-6548 |
| 1 | 25 | 2,500 | 11.10 | 2250 | 685 | 01-041-0789 |
| 1-1/4 | 32 | 3,800 | 16.90 | 1200 | 365 | 00-085-4424 |
| 1-1/2 | 38 | 5,000 | 22.20 | 1200 | 365 | 00-630-4873 |
| 3 | 76 | 18,500 | 82.30 | 1200 | 365 | 00-142-6115 |
| 4 | 102 | 31,000 | 137.90 | 600 | 182 | 00-630-4875 |

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Three-Strand Polypropylene
MIL-R-24049

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|----|--------------------------|-------|------------------------|-----|------------|
| inches | mm | lb | kN | feet | m | (4020-00-) |
| 3/4 | 19 | 1,000 | 4.45 | 2250 | 685 | 999-3894 |
| 1 | 25 | 1,700 | 7.55 | 900 | 274 | 530-0698 |
| 1 | 25 | 1,700 | 7.55 | 210 | 64 | 499-7529 |
| 1-1/2 | 38 | 3,700 | 16.45 | 50 | 15 | 874-7920 |
| 1-1/2 | 38 | 3,700 | 16.45 | 600 | 182 | 968-1352 |
| 2-1/4 | 57 | 7,000 | 31.15 | 200 | 61 | 874-7921 |
| 2-1/4 | 57 | 7,000 | 31.15 | 600 | 182 | 968-1354 |
| 3 | 76 | 13,000 | 57.80 | 600 | 182 | 968-1355 |

Double Braided Polyester Filament With Staple Wrap

MIL-R-24536

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|-----|--------------------------|--------|------------------------|-----|------------|
| inches | mm | lb | kN | feet | m | (4020-01-) |
| 3/4 | 19 | 1,700 | 7.55 | 600 | 182 | 028-3823 |
| 1 | 25 | 2,600 | 11.55 | 600 | 182 | 028-3824 |
| 1-1/8 | 29 | 3,600 | 16.00 | 600 | 182 | 329-2775 |
| 1-1/4 | 32 | 4,700 | 20.50 | 600 | 182 | 028-3844 |
| 1-1/2 | 38 | 6,000 | 26.70 | 600 | 182 | 028-4526 |
| 1-3/4 | 44 | 7,900 | 35.15 | 600 | 182 | 028-4527 |
| 2 | 51 | 10,000 | 44.50 | 600 | 182 | 028-4525 |
| 2-1/4 | 57 | 12,200 | 54.25 | 600 | 182 | 028-6770 |
| 2-1/2 | 64 | 14,700 | 65.40 | 600 | 182 | 029-2776 |
| 2-3/4 | 70 | 17,400 | 77.40 | 600 | 182 | 028-4531 |
| 3 | 76 | 20,000 | 89.00 | 350 | 106 | 029-8665 |
| 3 | 76 | 20,000 | 89.00 | 700 | 213 | 028-3845 |
| 3-1/4 | 83 | 23,400 | 104.00 | 600 | 182 | 029-2777 |
| 3-1/2 | 99 | 26,700 | 118.75 | 600 | 182 | 029-3846 |
| 3-3/4 | 92 | 30,000 | 133.45 | 600 | 182 | 028-3822 |
| 4 | 102 | 33,700 | 150.00 | 350 | 106 | 029-8663 |
| 4 | 102 | 33,700 | 150.00 | 1200 | 365 | 028-4528 |
| 4-1/2 | 114 | 45,000 | 200.15 | 600 | 182 | 028-4529 |
| 5 | 127 | 50,000 | 222.40 | 600 | 182 | 028-4530 |

Three-Strand Dual Fiber
MIL-R-43942

| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|----|--------------------------|-------|------------------------|-----|------------|
| inches | mm | lb | kN | feet | m | (4020-01-) |
| 3/4 | 19 | 1,130 | 5.00 | 2250 | 685 | 036-6819 |
| 1 | 25 | 1,710 | 7.60 | 2250 | 685 | 036-6820 |
| 1-1/8 | 29 | 2,430 | 10.80 | 1600 | 487 | 037-6290 |
| 1-1/2 | 38 | 3,960 | 17.60 | 1200 | 365 | 036-6291 |
| 2 | 51 | 5,760 | 25.60 | 1200 | 365 | 037-6292 |
| 2-1/4 | 57 | 7,560 | 33.60 | 1200 | 365 | 037-6293 |

Plaited Dual Fiber

MIL-R-43952

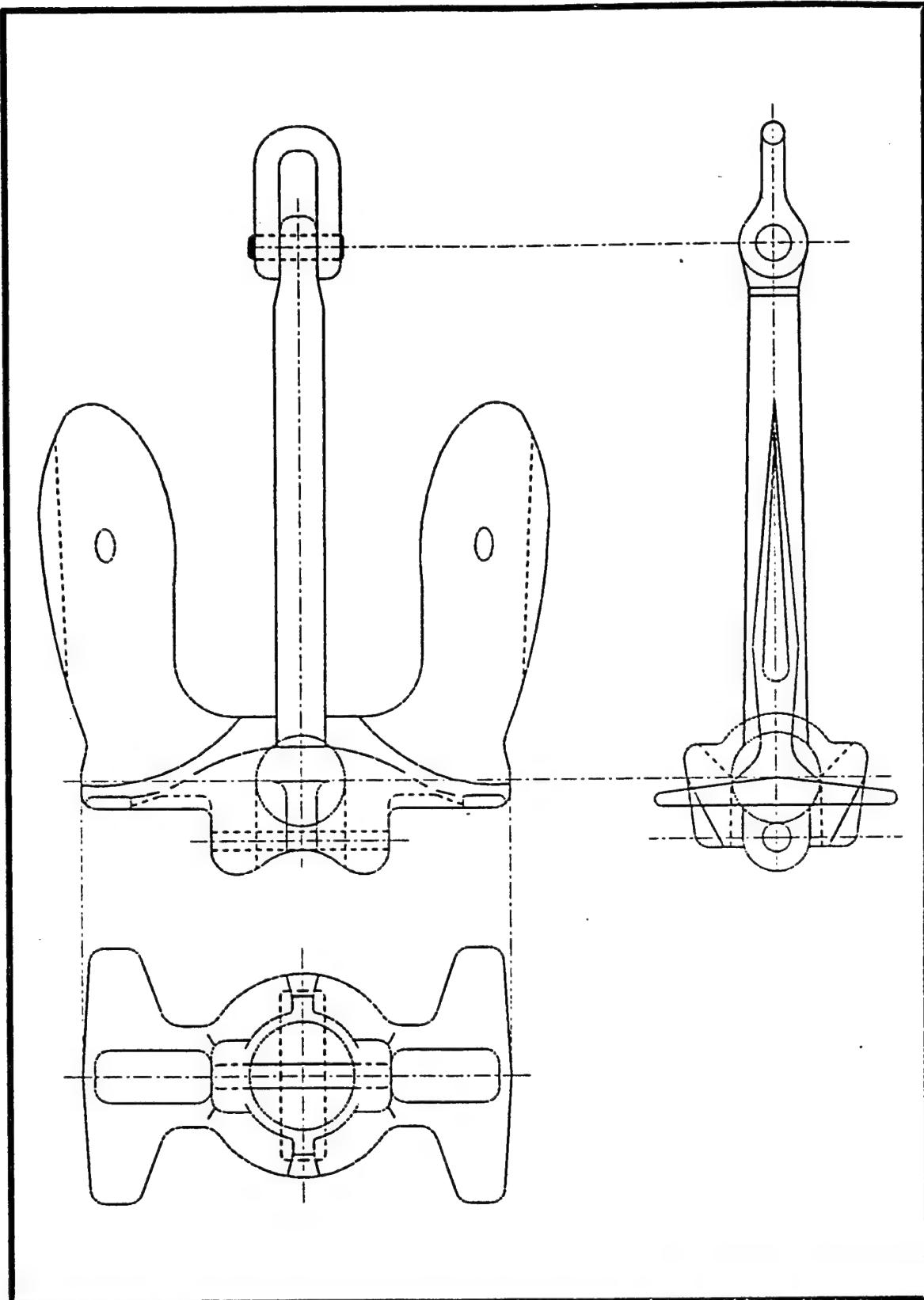
| <u>Circumference</u> | | <u>Breaking strength</u> | | <u>Standard length</u> | | <u>NSN</u> |
|----------------------|----|--------------------------|-------|------------------------|-----|------------|
| inches | mm | lb | kN | feet | m | (4020-01-) |
| 1-1/8 | 29 | 2,430 | 10.80 | 1600 | 487 | 038-4897 |
| 1-1/2 | 38 | 3,960 | 17.60 | 1200 | 365 | 038-4898 |
| 2-1/2 | 64 | 9,180 | 40.85 | 1200 | 365 | 038-4999 |

APPENDIX C

Minimum Number of Lines Used in Preliminary Mooring Analysis

In the preliminary design stage the following table may be used to prepare a mooring line arrangement for analysis purposes. All lines are presumed to be doubled up, with three parts per line.

| Ship type | Displacement
(long tons) | Number and size of
mooring lines (heavy
weather condition) | Camel
width
(feet) |
|--------------|-----------------------------|--|--------------------------|
| Destroyers | 2000 - 4000 | Eight 5-inch | 4 |
| | 4000 - 6000 | Eight 6-inch | 4 |
| | 6000 - 8000 | Nine 6-inch | 4 |
| Cruisers | 8000 - 12000 | Two 8-inch, eight
6-1/2-inch | 6 |
| | 12000 - 16000 | Four 8-inch, eight
6-1/2-inch | 6 |
| Auxiliaries | 15000 - 20000 | Four 8-inch, eight
6-1/2-inch | |
| | 20000 - 25000 | Four 9-inch, eight
6-1/2-inch | 6 |
| | 25000 - 30000 | Four 9-inch, eight
7-inch | 6 |
| Minesweepers | | Six 5-inch | - |
| Tugs | | Six 5-inch | - |



U.S. Navy Stockless Anchor

CHAIN - 8-6-93 (C-40)

* FLASH BUTT-WELDED * * NON-MAGNETIC FBW *

MIL-C-24633A

MIL-C-24774

| WIRE DIA | BRK STR (#) | MX WT/SH | BRK STR (#) | MX WT/SH |
|----------|-------------|----------|-------------|----------|
| 3/4 | 75,000 | 525 | 64,800 | 563 |
| 7/8 | 98,000 | 713 | 88,200 | 765 |
| 1 | 129,000 | 925 | 115,200 | 1,000 |
| 1-1/8 | 161,000 | 1,150 | 145,800 | 1,270 |
| 1-1/4 | 198,000 | 1,430 | 180,000 | 1,565 |
| 1-3/8 | 235,000 | 1,760 | | |
| 1-1/2 | 280,000 | 2,080 | | |
| 1-5/8 | 325,000 | 2,390 | | |
| 1-3/4 | 380,000 | 2,750 | | |
| 1-7/8 | 432,000 | 3,150 | | |
| 2 | 454,000 | 3,540 | | |
| 2-1/8 | 510,000 | 3,980 | | |
| 2-1/4 | 570,000 | 4,450 | | |
| 2-3/8 | 628,000 | 4,960 | | |
| 2-1/2 | 692,000 | 5,490 | | |
| 2-5/8 | 758,000 | 6,280 | | |
| 2-3/4 | 826,000 | 6,890 | | |
| 2-7/8 | 897,000 | 7,520 | | |
| 3 | 970,000 | 8,180 | | |
| 3-1/8 | 1,046,000 | 8,890 | | |
| 3-1/4 | 1,124,000 | 9,600 | | |
| 3-3/8 | 1,204,000 | 10,350 | | |
| 3-1/2 | 1,285,000 | 11,140 | | |
| 3-5/8 | 1,369,000 | 12,190 | | |
| 3-3/4 | 1,455,000 | 12,920 | | |
| 3-7/8 | 1,543,000 | 13,850 | | |
| 4 | 1,632,000 | 14,680 | | |
| 4-1/8 | 1,724,000 | 15,520 | | |
| 4-1/4 | 1,817,000 | 16,360 | | |
| 4-3/8 | 1,911,000 | 17,200 | | |
| 4-1/2 | 2,008,000 | 18,030 | | |
| 4-5/8 | 2,105,000 | 18,840 | | |
| 4-3/4 | 2,550,000 | 20,300 | | |

FIBEROPE - 1-19-94 (O-49)

* ARAMID 4-STR *

<% STRETCH @BRK STR>> CID A-A-50435B <6%>

* POLYESTER DB *

MIL-R-24677A <30%>

| NOM DIA | NOM CIRC | ACCP B/S (#) | WT (#/F) | ACCP B/S (#) | WT (#/F) |
|----------|----------|--------------|----------|--------------|----------|
| 3/16 D | 5/8 C | | | | |
| 1/4 D | 3/4 C | | | 1,900 | 0.020 |
| 5/16 D | 1 C | | | 2,935 | 0.031 |
| 3/8 D | 1-1/8 C | | | 4,245 | 0.045 |
| 7/16 D | 1-1/4 C | | | *5,730* | 0.061 |
| 1/2 D | 1-1/2 C | | | 7,500 | 0.080 |
| 9/16 D | 1-3/4 C | | | 9,450 | 0.101 |
| 5/8 D | 2 C | | | 11,660 | 0.125 |
| 3/4 D | 2-1/4 C | | | 16,610 | 0.179 |
| 13/16 D | 2-1/2 C | | | 19,580 | 0.211 |
| 7/8 D | 2-3/4 C | | | 22,660 | 0.244 |
| 1 D | 3 C | | | 29,480 | 0.319 |
| 1-1/16 D | 3-1/4 C | | | | |
| | 3-3/8 C | 50,000 | 0.329 | | |
| 1-1/8 D | 3-1/2 C | 60,000 | 0.369 | 37,290 | 0.404 |
| 1-1/4 D | 3-3/4 C | 70,000 | 0.416 | 45,870 | 0.498 |
| 1-5/16 D | 4 C | | | 50,600 | 0.550 |
| | 4-1/8 C | 96,000 | 0.503 | | |
| 1-1/2 D | 4-1/2 C | | | 61,000 | 0.718 |
| | 4-3/4 C | 135,000 | 0.657 | | |
| 1-5/8 D | 5 C | | | 74,000 | 0.840 |
| | 5-3/8 C | 180,000 | 0.859 | | |
| 1-3/4 D | 5-1/2 C | | | 84,000 | 0.977 |
| | 5-7/8 C | 225,000 | 1.13 | | |
| 2 D | 6 C | | | 105,000 | 1.28 |
| | 6-1/4 C | 280,000 | 1.42 | | |
| 2-1/8 D | 6-1/2 C | | | 118,000 | 1.44 |
| 2-1/4 D | 7 C | | | 133,600 | 1.61 |
| 2-1/2 D | 7-1/2 C | | | 162,000 | 1.99 |
| | 7-5/8 C | 350,000 | 1.74 | | |
| 2-5/8 D | 8 C | | | 180,000 | 2.20 |
| | 8-3/16 C | 420,000 | 2.09 | | |
| 3 D | 9 C | | | 232,000 | 2.87 |
| 3-1/4 D | 10 C | | | 277,000 | 3.37 |
| 3-5/8 D | 11 C | | | 335,000 | 4.19 |
| 4 D | 12 C | | | 396,150 | 5.10 |
| 4-1/4 D | 13 C | | | 446,500 | 5.76 |
| 4-1/2 D | 14 C | | | 500,650 | 6.46 |
| 5 D | 15 C | | | 616,550 | 7.98 |
| 5-1/4 D | 16 C | | | 679,250 | 8.79 |

* (1-5/16 C) *

FIBEROPE - 1-19-94 (O-49)

| <% STRETCH @BRK STR>> | | * POLYESTER 12-STR * | | * POLYESTER 8-STR PL * | |
|-----------------------|----------|----------------------|----------|------------------------|----------|
| NOM DIA | NOM CIRC | ACCP B/S (#) | WT (#/F) | ACCP B/S (#) | WT (#/F) |
| 3/16 D | 5/8 C | | | | |
| 1/4 D | 3/4 C | | | 2,000 | 0.020 |
| 5/16 D | 1 C | | | 3,100 | 0.031 |
| 3/8 D | 1-1/8 C | 4,240 | 0.042 | 4,500 | 0.045 |
| 7/16 D | 1-1/4 C | *5,680* | 0.057 | *6,000* | 0.062 |
| 1/2 D | 1-1/2 C | 7,440 | 0.077 | 7,700 | 0.080 |
| 9/16 D | 1-3/4 C | 9,280 | 0.098 | 9,700 | 0.102 |
| 5/8 D | 2 C | 11,520 | 0.115 | 12,100 | 0.130 |
| 3/4 D | 2-1/4 C | 16,640 | 0.166 | 15,200 | 0.175 |
| 13/16 D | 2-1/2 C | | | 18,800 | 0.206 |
| 7/8 D | 2-3/4 C | 19,440 | 0.226 | 21,800 | 0.250 |
| 1 D | 3 C | 25,600 | 0.300 | 26,700 | 0.304 |
| 1-1/16 D | 3-1/4 C | | | | |
| | 3-3/8 C | | | | |
| 1-1/8 D | 3-1/2 C | 32,800 | 0.380 | 35,900 | 0.400 |
| 1-1/4 D | 3-3/4 C | 37,600 | 0.440 | 40,200 | 0.464 |
| 1-5/16 D | 4 C | 43,200 | 0.500 | 45,600 | 0.525 |
| | 4-1/8 C | | | | |
| 1-1/2 D | 4-1/2 C | 54,400 | 0.630 | 56,900 | 0.670 |
| | 4-3/4 C | | | | |
| 1-5/8 D | 5 C | 67,200 | 0.780 | 69,500 | 0.820 |
| | 5-3/8 C | | | | |
| 1-3/4 D | 5-1/2 C | 80,800 | 0.940 | 82,000 | 0.980 |
| | 5-7/8 C | | | | |
| 2 D | 6 C | 96,000 | 1.12 | 97,200 | 1.18 |
| | 6-1/4 C | | | | |
| 2-1/8 D | 6-1/2 C | 113,600 | 1.32 | 112,000 | 1.35 |
| 2-1/4 D | 7 C | 131,200 | 1.53 | 129,000 | 1.57 |
| 2-1/2 D | 7-1/2 C | 151,200 | 1.76 | 149,000 | 1.81 |
| | 7-5/8 C | | | | |
| 2-5/8 D | 8 C | 172,000 | 2.00 | 167,000 | 2.04 |
| | 8-3/16 C | | | | |
| 3 D | 9 C | 215,200 | 2.53 | 208,000 | 2.58 |
| 3-1/4 D | 10 C | 264,800 | 3.12 | 255,000 | 3.18 |
| 3-5/8 D | 11 C | 319,200 | 3.78 | 306,000 | 3.84 |
| 4 D | 12 C | 376,800 | 4.49 | 365,000 | 4.54 |
| 4-1/4 D | 13 C | 440,800 | 5.27 | 429,000 | 5.40 |
| 4-1/2 D | 14 C | 508,800 | 6.12 | 496,000 | 6.30 |
| 5 D | 15 C | 581,600 | 7.02 | 570,000 | 7.20 |
| 5-1/4 D | 16 C | | | 638,000 | 8.20 |

(1-5/16 C)

(1-5/16 C)

FIBEROPE - 1-19-94 (O-49)

| <% STRETCH @BRK STR>> | | * POLYESTER 3-STR * | | * POLYESTER DB (SW) * | |
|-----------------------|----------|----------------------|----------|-----------------------|----------|
| | | MIL-R-30500B/2 <35%> | | MIL-R-24536 <25%> | |
| NOM DIA | NOM CIRC | ACCPt B/S (#) | WT (#/F) | ACCPt B/S (#) | WT (#/F) |
| 3/16 D | 5/8 C | 800 | 0.012 | | |
| 1/4 D | 3/4 C | 1,200 | 0.021 | 1,700 | 0.017 |
| 5/16 D | 1 C | 2,000 | 0.032 | 2,600 | 0.026 |
| 3/8 D | 1-1/8 C | 2,800 | 0.046 | 3,600 | 0.038 |
| 7/16 D | 1-1/4 C | 3,800 | 0.062 | 4,700 | 0.053 |
| 1/2 D | 1-1/2 C | 5,000 | 0.081 | 6,000 | 0.067 |
| 9/16 D | 1-3/4 C | 6,500 | 0.105 | 7,900 | 0.091 |
| 5/8 D | 2 C | 8,000 | 0.132 | 10,000 | 0.118 |
| 3/4 D | 2-1/4 C | 10,000 | 0.175 | 12,200 | 0.149 |
| 13/16 D | 2-1/2 C | 13,000 | 0.198 | 14,700 | 0.185 |
| 7/8 D | 2-3/4 C | 15,000 | 0.250 | 17,400 | 0.222 |
| 1 D | 3 C | 18,500 | 0.300 | 20,000 | 0.267 |
| 1-1/16 D | 3-1/4 C | | | 23,400 | 0.313 |
| | 3-3/8 C | | | | |
| 1-1/8 D | 3-1/2 C | 25,000 | 0.420 | 26,700 | 0.364 |
| 1-1/4 D | 3-3/4 C | | | 30,000 | 0.417 |
| 1-5/16 D | 4 C | 31,000 | 0.525 | 33,700 | 0.476 |
| | 4-1/8 C | | | | |
| 1-1/2 D | 4-1/2 C | | | 45,000 | 0.599 |
| | 4-3/4 C | | | | |
| 1-5/8 D | 5 C | 48,000 | 0.808 | 50,000 | 0.741 |
| | 5-3/8 C | | | | |
| 1-3/4 D | 5-1/2 C | | | | |
| | 5-7/8 C | | | | |
| 2 D | 6 C | 68,000 | 1.24 | | |
| | 6-1/4 C | | | | |
| 2-1/8 D | 6-1/2 C | | | | |
| 2-1/4 D | 7 C | 88,000 | 1.59 | | |
| 2-1/2 D | 7-1/2 C | | | | |
| | 7-5/8 C | | | | |
| 2-5/8 D | 8 C | 110,000 | 2.10 | | |
| | 8-3/16 C | | | | |
| 3 D | 9 C | 140,000 | 2.63 | | |
| 3-1/4 D | 10 C | 165,000 | 3.18 | | |
| 3-5/8 D | 11 C | 240,000 | 4.00 | | |
| 4 D | 12 C | 285,000 | 4.67 | | |
| 4-1/4 D | 13 C | | | | |
| 4-1/2 D | 14 C | | | | |
| 5 D | 15 C | | | | |
| 5-1/4 D | 16 C | | | | |

FIBEROPE - 1-19-94 (O-49)

| <% STRETCH @BRK STR>> | | * POLYESTER PL (SW) * | | * NYLON DB * | |
|-----------------------|----------|-----------------------|----------|--------------|----------|
| NOM DIA | NOM CIRC | ACCP B/S (#) | WT (#/F) | ACCP B/S (#) | WT (#/F) |
| 3/16 D | 5/8 C | | | | |
| 1/4 D | 3/4 C | 2,080 | 0.021 | 1,785 | 0.015 |
| 5/16 D | 1 C | 2,980 | 0.032 | 2,835 | 0.024 |
| 3/8 D | 1-1/8 C | 3,970 | 0.044 | 4,095 | 0.034 |
| 7/16 D | 1-1/4 C | 5,050 | 0.057 | *5,355* | 0.047 |
| 1/2 D | 1-1/2 C | 6,400 | 0.074 | 7,245 | 0.061 |
| 9/16 D | 1-3/4 C | 8,100 | 0.096 | 9,450 | 0.083 |
| 5/8 D | 2 C | 9,900 | 0.122 | 12,600 | 0.108 |
| 3/4 D | 2-1/4 C | 12,200 | 0.152 | 15,750 | 0.137 |
| 13/16 D | 2-1/2 C | 14,500 | 0.184 | 19,320 | 0.169 |
| 7/8 D | 2-3/4 C | 16,700 | 0.215 | 23,625 | 0.204 |
| 1 D | 3 C | 19,000 | 0.252 | 27,825 | 0.243 |
| 1-1/16 D | 3-1/4 C | 22,000 | 0.296 | | |
| | 3-3/8 C | | | | |
| 1-1/8 D | 3-1/2 C | 25,000 | 0.336 | 37,800 | 0.331 |
| 1-1/4 D | 3-3/4 C | 27,500 | 0.378 | 44,100 | 0.380 |
| 1-5/16 D | 4 C | 30,700 | 0.425 | 50,400 | 0.433 |
| | 4-1/8 C | | | | |
| 1-1/2 D | 4-1/2 C | 37,000 | 0.630 | 64,200 | 0.546 |
| | 4-3/4 C | | | | |
| 1-5/8 D | 5 C | | | 78,110 | 0.676 |
| | 5-3/8 C | | | | |
| 1-3/4 D | 5-1/2 C | | | 96,300 | 0.820 |
| | 5-7/8 C | | | | |
| 2 D | 6 C | | | 109,675 | 0.971 |
| | 6-1/4 C | | | | |
| 2-1/8 D | 6-1/2 C | | | 131,610 | 1.14 |
| 2-1/4 D | 7 C | | | 149,800 | 1.32 |
| 2-1/2 D | 7-1/2 C | | | 171,200 | 1.52 |
| | 7-5/8 C | | | | |
| 2-5/8 D | 8 C | | | 192,600 | 1.73 |
| | 8-3/16 C | | | | |
| 3 D | 9 C | | | 243,000 | 2.19 |
| 3-1/4 D | 10 C | | | 284,840 | 2.70 |
| 3-5/8 D | 11 C | | | 351,000 | 3.27 |
| 4 D | 12 C | | | 415,800 | 3.89 |
| 4-1/4 D | 13 C | | | 475,200 | 4.50 |
| 4-1/2 D | 14 C | | | 548,640 | 5.24 |
| 5 D | 15 C | | | 622,080 | 6.00 |
| 5-1/4 D | 16 C | | | 702,000 | 6.85 |

* (@75%BS) *

* (1-5/16 C) *

FIBEROPE - 1-19-94 (O-49)

| <% STRETCH @BRK STR>> | | * NYLON 8-STR PL * | | * NYLON 3-STR * | |
|-----------------------|----------|--------------------|----------|-----------------|----------|
| NOM DIA | NOM CIRC | ACCPt B/S (#) | WT (#/F) | ACCPt B/S (#) | WT (#/F) |
| 3/16 D | 5/8 C | | | 950 | 0.010 |
| 1/4 D | 3/4 C | 1,500 | 0.014 | 1,500 | 0.016 |
| 5/16 D | 1 C | 2,500 | 0.023 | 2,600 | 0.028 |
| 3/8 D | 1-1/8 C | 3,700 | 0.035 | 3,300 | 0.036 |
| 7/16 D | 1-1/4 C | 5,000 | 0.049 | 4,800 | 0.051 |
| 1/2 D | 1-1/2 C | 6,400 | 0.062 | 5,800 | 0.063 |
| 9/16 D | 1-3/4 C | 8,000 | 0.075 | 7,600 | 0.083 |
| 5/8 D | 2 C | 11,000 | 0.102 | 9,800 | 0.106 |
| 3/4 D | 2-1/4 C | 17,000 | 0.141 | 13,200 | 0.143 |
| 13/16 D | 2-1/2 C | 20,000 | 0.162 | 15,300 | 0.169 |
| 7/8 D | 2-3/4 C | 24,000 | 0.195 | 19,000 | 0.207 |
| 1 D | 3 C | 31,000 | 0.250 | 23,200 | 0.253 |
| 1-1/16 D | 3-1/4 C | | | | |
| | 3-3/8 C | | | | |
| 1-1/8 D | 3-1/2 C | 38,000 | 0.339 | 32,000 | 0.347 |
| 1-1/4 D | 3-3/4 C | 46,000 | 0.400 | 36,500 | 0.400 |
| 1-5/16 D | 4 C | 53,000 | 0.430 | 41,300 | 0.453 |
| | 4-1/8 C | | | | |
| 1-1/2 D | 4-1/2 C | 63,000 | 0.500 | 50,000 | 0.582 |
| | 4-3/4 C | | | | |
| 1-5/8 D | 5 C | 73,000 | 0.680 | 60,000 | 0.702 |
| | 5-3/8 C | | | | |
| 1-3/4 D | 5-1/2 C | 78,000 | 0.820 | 72,000 | 0.843 |
| | 5-7/8 C | | | | |
| 2 D | 6 C | 95,000 | 0.950 | 90,000 | 1.06 |
| | 6-1/4 C | | | | |
| 2-1/8 D | 6-1/2 C | 106,000 | 1.09 | 100,000 | 1.18 |
| 2-1/4 D | 7 C | 125,000 | 1.25 | 127,000 | 1.50 |
| 2-1/2 D | 7-1/2 C | 137,000 | 1.41 | | |
| | 7-5/8 C | | | | |
| 2-5/8 D | 8 C | 165,000 | 1.67 | 164,000 | 1.95 |
| | 8-3/16 C | | | | |
| 3 D | 9 C | 200,000 | 2.14 | 209,000 | 2.51 |
| 3-1/4 D | 10 C | 250,000 | 2.62 | 265,000 | 3.20 |
| 3-5/8 D | 11 C | 300,000 | 3.19 | 316,000 | 3.85 |
| 4 D | 12 C | 360,000 | 3.84 | 375,000 | 4.58 |
| 4-1/4 D | 13 C | 380,000 | 4.46 | | |
| 4-1/2 D | 14 C | 441,000 | 5.17 | | |
| 5 D | 15 C | 507,000 | 5.95 | | |
| 5-1/4 D | 16 C | 572,000 | 6.76 | | |

FIBEROPE - 1-19-94 (O-49)

| <% STRETCH @BRK STR>> | | * POLYPROPYLENE 3-STR * | | * MANILA 3-STR * | |
|-----------------------|----------|-------------------------|--------------------|------------------|----------|
| | | MIL-R-24049B <45%> | T-R-605B/3 <*20%*> | ACCP B/S (#) | WT (#/F) |
| NOM DIA | NOM CIRC | ACCP B/S (#) | WT (#/F) | ACCP B/S (#) | WT (#/F) |
| 3/16 D | 5/8 C | 720 | 0.008 | 405 | 0.015 |
| 1/4 D | 3/4 C | 1,130 | 0.012 | 540 | 0.020 |
| 5/16 D | 1 C | 1,710 | 0.021 | 900 | 0.029 |
| 3/8 D | 1-1/8 C | 2,440 | 0.028 | 1,215 | 0.041 |
| 7/16 D | 1-1/4 C | 3,160 | 0.033 | 1,575 | 0.053 |
| 1/2 D | 1-1/2 C | 3,780 | 0.048 | 2,385 | 0.075 |
| 9/16 D | 1-3/4 C | 4,600 | 0.063 | 3,105 | 0.104 |
| 5/8 D | 2 C | 5,600 | 0.083 | 3,960 | 0.13 |
| 3/4 D | 2-1/4 C | 7,650 | 0.110 | 4,860 | 0.17 |
| 13/16 D | 2-1/2 C | 8,900 | 0.132 | 5,850 | 0.19 |
| 7/8 D | 2-3/4 C | 10,400 | 0.157 | 6,930 | 0.22 |
| 1 D | 3 C | 12,600 | 0.192 | 8,100 | 0.27 |
| 1-1/16 D | 3-1/4 C | | | 9,450 | 0.31 |
| | 3-3/8 C | | | | |
| 1-1/8 D | 3-1/2 C | 16,500 | 0.263 | 10,800 | 0.36 |
| 1-1/4 D | 3-3/4 C | 18,900 | 0.303 | 12,150 | 0.42 |
| 1-5/16 D | 4 C | 21,200 | 0.342 | 13,500 | 0.48 |
| | 4-1/8 C | | | | |
| 1-1/2 D | 4-1/2 C | 26,800 | 0.439 | 16,650 | 0.60 |
| | 4-3/4 C | | | | |
| 1-5/8 D | 5 C | 32,400 | 0.526 | 20,250 | 0.75 |
| | 5-3/8 C | | | | |
| 1-3/4 D | 5-1/2 C | 38,800 | 0.633 | 23,850 | 0.89 |
| | 5-7/8 C | | | | |
| 2 D | 6 C | 46,800 | 0.794 | 27,900 | 1.08 |
| | 6-1/4 C | | | | |
| 2-1/8 D | 6-1/2 C | 55,000 | 0.909 | | |
| 2-1/4 D | 7 C | 62,000 | 1.11 | 36,900 | 1.46 |
| 2-1/2 D | 7-1/2 C | | | | |
| | 7-5/8 C | | | | |
| 2-5/8 D | 8 C | 81,000 | 1.43 | 46,800 | 1.91 |
| | 8-3/16 C | | | | |
| 3 D | 9 C | 103,000 | 1.83 | 57,600 | 2.42 |
| 3-1/4 D | 10 C | 123,000 | 2.33 | 69,300 | 2.99 |
| 3-5/8 D | 11 C | | | 81,900 | 3.66 |
| 4 D | 12 C | | | 94,500 | 4.35 |
| 4-1/4 D | 13 C | | | | |
| 4-1/2 D | 14 C | | | | |
| 5 D | 15 C | | | | |
| 5-1/4 D | 16 C | | | | |

* (REF) *

FIBEROPE - 1-19-94 (O-49)

* SISAL 3-STR *

<% STRETCH @BRK STR>> T-R-605B <*20%*>

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| NOM DIA | NOM CIRC | ACCPCT B/S (#) | WT (#/F) |
|----------|----------|----------------|----------|
| 3/16 D | 5/8 C | 360 | 0.015 |
| 1/4 D | 3/4 C | 480 | 0.020 |
| 5/16 D | 1 C | 800 | 0.029 |
| 3/8 D | 1-1/8 C | 1,080 | 0.041 |
| 7/16 D | 1-1/4 C | 1,400 | 0.053 |
| 1/2 D | 1-1/2 C | 2,120 | 0.075 |
| 9/16 D | 1-3/4 C | 2,760 | 0.104 |
| 5/8 D | 2 C | 3,520 | 0.13 |
| 3/4 D | 2-1/4 C | 4,320 | 0.17 |
| 13/16 D | 2-1/2 C | 5,200 | 0.19 |
| 7/8 D | 2-3/4 C | 6,160 | 0.22 |
| 1 D | 3 C | 7,200 | 0.27 |
| 1-1/16 D | 3-1/4 C | 8,400 | 0.31 |
| | 3-3/8 C | | |
| 1-1/8 D | 3-1/2 C | 9,600 | 0.36 |
| 1-1/4 D | 3-3/4 C | 10,800 | 0.42 |
| 1-5/16 D | 4 C | 12,000 | 0.48 |
| | 4-1/8 C | | |
| 1-1/2 D | 4-1/2 C | 14,800 | 0.60 |
| | 4-3/4 C | | |
| 1-5/8 D | 5 C | 18,000 | 0.75 |
| | 5-3/8 C | | |
| 1-3/4 D | 5-1/2 C | 21,200 | 0.89 |
| | 5-7/8 C | | |
| 2 D | 6 C | 24,800 | 1.08 |
| | 6-1/4 C | | |
| 2-1/8 D | 6-1/2 C | | |
| 2-1/4 D | 7 C | 32,800 | 1.46 |
| 2-1/2 D | 7-1/2 C | | |
| | 7-5/8 C | | |
| 2-5/8 D | 8 C | 41,600 | 1.91 |
| | 8-3/16 C | | |
| 3 D | 9 C | 51,200 | 2.42 |
| 3-1/4 D | 10 C | 61,600 | 2.99 |
| 3-5/8 D | 11 C | 72,800 | 3.66 |
| 4 D | 12 C | 84,000 | 4.35 |
| 4-1/4 D | 13 C | | |
| 4-1/2 D | 14 C | | |
| 5 D | 15 C | | |
| 5-1/4 D | 16 C | | |

* (REF) *

WIREROPE - 8-6-93 (E-33)

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* WIRE/6X37 EIPS IWRC * * WIRE/6X37 IPS IWRC * * WIRE/6X37 IPS FC *

RR-W-410D TABLE XII RR-W-410D TABLE XI RR-W-410D TABLE X

| NOM DIA | NOM CIRC | ACCPCT B/S (#) | WT (#/F) | ACCPCT B/S (#) | WT (#/F) | ACCPCT B/S (#) | WT (#/F) |
|---------|----------|----------------|----------|----------------|----------|----------------|----------|
| 3/16 D | 5/8 C | | | | | | |
| 1/4 D | 3/4 C | 6,640 | 0.116 | 5,740 | 0.116 | 5,340 | 0.105 |
| 5/16 D | 1 C | 10,280 | 0.180 | 8,940 | 0.180 | 8,300 | 0.164 |
| 3/8 D | 1-1/8 C | 14,720 | 0.260 | 12,800 | 0.260 | 11,900 | 0.236 |
| 7/16 D | 1-3/8 C | 19,900 | 0.350 | 17,340 | 0.350 | 16,120 | 0.320 |
| 1/2 D | 1-5/8 C | 26,000 | 0.460 | 22,400 | 0.460 | 20,800 | 0.420 |
| 9/16 D | 1-3/4 C | 32,800 | 0.590 | 28,200 | 0.590 | 26,400 | 0.530 |
| 5/8 D | 2 C | 40,200 | 0.720 | 35,000 | 0.720 | 32,600 | 0.660 |
| 3/4 D | 2-3/8 C | 57,400 | 1.04 | 50,000 | 1.04 | 46,400 | 0.950 |
| 7/8 D | 2-3/4 C | 77,600 | 1.42 | 67,400 | 1.42 | 62,800 | 1.29 |
| 1 D | 3-1/8 C | 100,800 | 1.85 | 87,600 | 1.85 | 81,600 | 1.68 |
| 1-1/8 D | 3-1/2 C | 126,800 | 2.34 | 110,200 | 2.34 | 102,600 | 2.13 |
| 1-1/4 D | 3-7/8 C | 155,800 | 2.89 | 135,400 | 2.89 | 126,000 | 2.63 |
| 1-3/8 D | 4-3/8 C | 187,200 | 3.50 | 162,800 | 3.50 | 151,600 | 3.18 |
| 1-1/2 D | 4-3/4 C | 222,000 | 4.16 | 192,800 | 4.16 | 179,400 | 3.78 |
| 1-5/8 D | 5-1/8 C | 258,000 | 4.88 | 224,000 | 4.88 | 208,000 | 4.44 |
| 1-3/4 D | 5-1/2 C | 298,000 | 5.67 | 260,000 | 5.67 | 242,000 | 5.15 |
| 1-7/8 D | 5-7/8 C | 340,000 | 6.50 | 296,000 | 6.50 | 274,000 | 5.91 |
| 2 D | 6-1/4 C | 386,000 | 7.39 | 336,000 | 7.39 | 312,000 | 6.72 |
| 2-1/8 D | 6-5/8 C | 431,000 | 8.35 | 374,000 | 8.35 | 350,000 | 7.59 |
| 2-1/4 D | 7-1/8 C | 482,000 | 9.36 | 420,000 | 9.36 | 390,000 | 8.51 |
| 2-1/2 D | 7-7/8 C | 589,000 | 11.6 | 511,000 | 11.6 | 476,000 | 10.5 |
| 2-3/4 D | 8-5/8 C | 704,000 | 14.0 | 612,000 | 14.0 | 570,000 | 12.7 |
| 3 D | 9-3/8 C | 828,000 | 16.6 | 722,000 | 16.6 | 668,000 | 15.1 |
| 3-1/4 D | 10-1/4 C | 960,000 | 19.5 | 836,000 | 19.5 | 798,000 | 17.7 |
| 3-1/2 D | 11 C | 1,100,000 | 22.7 | 958,000 | 22.7 | 892,000 | 20.6 |